

PUBLIC HEALTH REPORTS

In this issue



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service



Graduate School of Public Health

University of Pittsburgh

see overleaf

PUBLIC HEALTH REPORTS

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frontispiece . . .

This 8-story building will give the Graduate School of Public Health, University of Pittsburgh, its first permanent home since its founding in 1948. The school was established by the A. W. Mellon Educational and Charitable Trust. Dr. Thomas Parran, former Surgeon General of the Public Health Service, is dean.

Preliminary plans for the structure were approved in October 1954. They include two unique features, an "anechoic" chamber and a cobalt room.

In the soundproofed anechoic chamber physicists will be able to conduct measurements of sound, hearing, and noise without troublesome interference from reflections or echoes which would otherwise invalidate measurements.

The cobalt room will provide a protected area for storage of radioactive cobalt. The

material is necessary for use in instruments which determine leakage from medicine cobalt bombs now in use in the Pittsburgh district.

The new building will be located directly below Pitt Stadium and across from Children's Hospital. It will have an auditorium capable of seating 282.

The first two floors will house administrative offices, libraries, locker rooms, lounges, and cafeteria facilities. Remaining floors will include classrooms, laboratories, and offices for the departments of biochemistry and nutrition, biostatistics, epidemiology and microbiology, occupational health, and public health practice.

The university is also constructing a new building for its School of Health Professions (medicine, dentistry, nursing, and pharmacy).

*Drawing courtesy of Eggers and Higgins,
New York City.*

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Published concurrently with this issue:

PUBLIC HEALTH MONOGRAPH No. 26 . . . A history of plague in the United States.

Vernon B. Link.

120 pages; illustrations. A summary and information on availability appear on pages 335-336.



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A new method of finding cases of gonorrhea by visual inspection and microscopic examination of urine.

Gonorrhea Detection by Urine Examination

By S. ROSS TAGGART, M.D.

AN INTENSIVE epidemiological and public educational program directed toward gonorrhea control has been disappointing because it has not been successful in rapidly reducing the number of cases of gonorrhea being reported. If control is to be accelerated, additional case-finding measures must be established.

In hospitals, clinics, and physicians' offices, urine specimens of large numbers of patients are routinely examined for albumin, sugar, and so on. If, at this same time, gonorrhea could be found by examination of these urine specimens, an economical and simple case-finding aid would be available; a rapid screening procedure for detection of gonorrhea suspects would be provided. This paper presents the results obtained in a preliminary study of macroscopic inspection and microscopic examination of the sediment of urine specimens for the detection of gonorrhea in patients from a selected clinic group and from an unselected screening line group.

Methods

Urine specimens were collected in flat-bottomed specimen bottles. One to two cubic centi-

mers of 10-percent acetic acid was added to the fresh urine specimens, which were then macroscopically inspected. An opinion was recorded as to the presumptive presence of pus or shreds in the urine specimen. If shreds or pus were present, the specimen was considered presumptively positive for gonorrhea.

The urine specimen was then allowed to sit for at least 1 hour. After this period it was decanted and a spread was prepared from the sediment. The spread was air-dried, stained with a Gram's stain, and examined under an oil-immersion lens for the presence of gram-negative intracellular diplococci. Urine specimens which had been allowed to stand for any period before initial visual inspection were swirled before acidifying and then were allowed to stand for at least an hour before microscopic examination of the sediment.

When a microscopically positive sediment was found in a urine specimen and a diagnosis of gonorrhea had not been established in the patient prior to the urine test, the patient was re-examined bacteriologically. The diagnosis of gonorrhea was established or confirmed in all patients with positive sediment findings by urethral or cervical spread or, if indicated, by culture.

Results

The selected population group consisted of male patients who were examined in a venereal disease clinic. Of this group, 68 had a frank urethral discharge in which gonococci could be demonstrated. Using the test technique de-

Dr. Taggart is acting chief, preventable and chronic diseases division, bureau of disease control, District of Columbia Department of Public Health, Washington, D. C. This paper was presented at the Symposium on Recent Advances in the Study of Venereal Diseases, April 29-30, 1954.

scribed in this paper, 52 of these 68 patients, or approximately 75 percent, were found to have gram-negative intracellular cocci in the sediment of their urine specimens; these urine specimens also had been considered positive for gonorrhea by sample inspection, utilizing the technique described for screening. Thirty-two of these venereal disease clinic patients had no urethral discharge and had been considered clinically negative both by history and physical examination. However, in 3 of the patients (approximately 10 percent), positive findings in the sediment were obtained by microscopic examination (2 were positive and 1 was negative by macroscopic inspection). These diagnoses of gonorrhea were confirmed by bacteriological study of urethral scrapings.

In order to determine the effectiveness of this simple macroscopic technique under conditions in which patients were not appearing primarily for venereal disease diagnosis and treatment, it was applied to a different type of patient body. This group consisted of patients of the outpatient service of the District of Columbia General Hospital. Urine specimens from these patients are collected routinely as a part of their initial examination. These patients were being seen for various medical and surgical complaints, and without this examination would have been considered free of gonorrhea. The

urine specimens were examined by the test technique under consideration and the discovery rate of gonorrhea in this group was 15.0 percent in the males and 6.8 percent in the females. Demonstration of gonococci by urethral or cervical spread or culture was possible in all of these patients. Because this study was of a preliminary investigative nature, sugar fermentation studies for definitive bacteriological diagnoses were not considered necessary at this time.

The findings obtained in both groups are presented in the accompanying table.

Discussion

The results of this study of the detection of gonorrhea suspects by macroscopic examination of the sediment of urine specimens appear encouraging, and suggest the desirability of further study to determine whether this method might become practicable.

It would appear that a technique of macroscopic inspection followed by microscopic examination of sediment of presumptively positive urine specimens will establish a diagnosis of gonorrhea in approximately three-fourths of an infected group.

Culturing the urinary sediment of all patients would no doubt have raised the percentage

Results of macroscopic and microscopic examination of urine specimens from a selected clinic population group and an unselected screening line group

Type of patient	Total		Macro-positive, micro-positive		Macro-negative, micro-positive		Macro-positive, micro-negative		Macro-negative, micro-negative	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Selected venereal disease clinic group										
Male:										
Urethral discharge positive for gonorrhea.....	68	100.0	52	76.5	0	0	3	4.4	13	19.1
Urethral discharge absent.....	32	100.0	¹ 2	6.3	¹ 1	3.1	1	3.1	28	87.5
Unselected screening line group										
Male.....	120	100.0	¹ 16	13.3	¹ 2	1.7	6	5.0	96	80.0
Female.....	177	100.0	¹ 12	6.8	0	0	10	5.6	155	87.6

¹ Diagnosed bacteriologically as having gonorrhea, subsequent to presumptive diagnosis of gonorrhea based on examination of urine specimens.

of infected persons found. However, the technical difficulties and increased cost entailed by this procedure would, in most cases, not be warranted. Of greater significance to the gonorrhea control program is the fact that a simple method of screening large numbers of individuals who are infected with gonorrhea, but who have not been motivated to seek specific medical care, should be of value in the public health control of gonorrhea. From experimental inoculation studies with gonorrhea it is known that not all patients have the profuse outpouring of pus and urethral discomfort that are considered characteristic of the disease. It is this group, not sufficiently disturbed by the infection to seek specific care, which might be discovered, especially if the portion of the population in which the prevalence of gonorrhea might be expected to be high were screened.

The finding of an infection rate of 15 percent among a clinic group consisting of patients who were not destined for a type of examination which could be expected to bring them to treat-

ment for gonorrhea suggests the potential importance of this simple method of urine examination. It would appear that the preliminary studies herein described are sufficiently valuable to suggest the desirability of further investigation. It is known that gonorrhea thus far has been relatively resistant to various control procedures. In spite of simple, sure cure the disease has not responded to our control efforts in the same way as syphilis. One of the stumbling blocks has been the lack of a simple case-finding device. These preliminary results would seem to merit further investigation.

Summary

A simple, routine screening procedure for a presumptive diagnosis of gonorrhea by a macroscopic examination of urine samples has been described. In a high-prevalence population, such a technique should be an aid in case finding in a gonorrhea control program.

World Health Day, April 7, 1955

"Clean Water for Better Health" is the theme of the seventh anniversary celebration of the World Health Organization.

The "clean water" theme emphasizes the basic sanitary engineering services which construct safe water supplies and sewage disposal systems for the people of the world. United States membership in WHO helps to develop such long-term worldwide health programs. Short-term health programs abroad are promoted by United States health personnel assigned by the Foreign Operations Administration to health ministries.

The clean water program in the United States was estimated in the President's Economic Report to the Congress January 28, 1954, as requiring \$6 billion for water systems and \$9 billion for new sewers and waste facilities by 1960.

Advances in America's clean water program are supported by water pollution control activities of industry and of local, State, and Federal Government agencies. The Water Pollution Control Act of 1948 is the major instrument for coordinating this work. Research on water pollution control is conducted cooperatively by the Public Health Service Robert A. Taft Sanitary Engineering Center at Cincinnati, the National Technical Task Committee on Industrial Wastes (supported by private industry), by universities, and other institutions.

Mortality and Marital Status

By DEWEY SHURTLEFF, M.P.H.

A NUMBER of analyses have shown that married people live longer than single people. The most recent analysis published for the United States was for 1940 (1), and the figures clearly showed the lower mortality rates for the married population. In the years since 1940, there has been a tremendous change in mortality rates and a distinct increase in the married proportion of the population. In the light of these changes, it is of particular interest to reexamine the mortality rates by marital status based on the 1950 census.

Population Base

In the 1950 census (2), data on marital status were based on the replies to the question, "Is he (she) now married, widowed, divorced, separated, or has he never been married?" The question referred to status at the time of enumeration. Persons classified as married comprise, therefore, both those who have been married only once, those who remarried after having been widowed or divorced, and persons reported as separated. Those reported as never married or with annulled marriages were classified as single. Since it is probable that some divorced persons were reported as single, married, or widowed, the census returns doubtless

understated somewhat the actual number of divorced persons who have not remarried.

The distribution of the population by marital status for each age-sex group is shown in table 1. Most men were single at ages 20-24 years, but they soon got married; 3 out of 4 men were married at ages 25-29. Two out of three women were married by the time they were 20-24 years old, and at ages 25-29, 4 out of 5 were married. The peak percentage married was 87.1 for men at ages 40-44 and 86.2 for women at 30-34 years. From 35 years on for men and from 30 years on for women the single proportion of the population remained nearly constant, close to 10 percent. The proportion widowed increased with advancing age, much more so for women than for men. The peak percentage divorced was 3.0 for men at ages 50-54 and 3.7 for women at 40-44 years.

Mortality Data

Marital status at the time of death is reported routinely on the death certificate. Deaths classified in the same categories as the enumerated population are now available for 1949, 1950, and 1951; rates shown in this paper are based on the average annual number of deaths for these 3 years and on the population enumerated in the 1950 census.

The death rates are shown by marital status, age, and sex in table 2. To summarize, if the 1949-51 death rates for age 20 and over by marital status, age, and sex had occurred in a standard population distributed by age like the

Mr. Shurtleff is an analytical statistician in the Mortality Analysis Section, National Office of Vital Statistics, Public Health Service.

population for each sex enumerated in 1940, taking the expected numbers of deaths for the married as 100, the index numbers would be:

	<i>Single</i>	<i>Married</i>	<i>Widowed</i>	<i>Divorced</i>
Male.....	163	100	185	207
Female.....	124	100	155	155

These figures summarize the mortality differences among the marital classes. The lowest mortality is still found for the married population, the next most favorable in the single group, and the highest among the widowed and divorced. The differences in mortality between the married and the unmarried are greater for men than for women.

Mortality by Marital Status, Age, and Sex

It is evident from table 2 that all through the age span, for men and for women, the death rates are lower for the married than for the single, widowed, or divorced. For both men and women in every age group 20 years and over, the mortality rank-order of three of the marital classes generally remains the same: the lowest for the married, the next for the single, and the highest for the divorced. The rank-order of the widowed class shifts with advancing age. The death rate for widowers is the highest of the four marital classes at the early ages, but at ages beyond 60 years, the mortality of widowers is less than that of either single or divorced men. A similar pattern holds for women, although the death rates for widows do not fall below that of the divorced until after age 60.

The differences in death rates may be due, in part, to the greater tendency of healthier people to marry. The evidence for selection as a factor in the differences in rates may be seen more clearly by examining the relative differences in rates between the unmarried and the married at each age. Taking the mortality of the married as 100 in each age group, the chart shows the age-specific death rates for the single, widowed, and divorced expressed as percentages of the corresponding rate for the married. The differences are the greatest between married and unmarried men between the ages of 25 and 44. Similarly, the differences between married and unmarried women are greatest between the ages of 25 and 34. Beyond these ages the curves

Table 1. Percentage distribution of the population by marital status, according to age and sex: United States, 1950

Sex and age (in years)	Single	Married	Wid- owed	Divorced
<i>Male</i>				
20 and over.....	17.0	76.1	4.7	2.2
20-24.....	59.1	39.9	.2	.9
25-29.....	23.8	74.2	.3	1.7
30-34.....	13.2	84.3	.4	2.1
35-39.....	10.1	86.8	.7	2.4
40-44.....	9.0	87.1	1.2	2.7
45-49.....	8.7	86.2	2.1	2.9
50-54.....	8.3	85.0	3.7	3.0
55-59.....	8.3	83.1	5.9	2.7
60-64.....	8.6	79.3	9.6	2.5
65-69.....	8.7	74.0	15.0	2.3
70-74.....	8.3	67.5	22.2	1.9
75 and over.....	7.8	52.4	38.5	1.3
<i>Female</i>				
20 and over.....	11.8	72.3	13.3	2.7
20-24.....	32.3	65.6	.4	1.7
25-29.....	13.3	83.3	.9	2.5
30-34.....	9.3	86.2	1.6	3.0
35-39.....	8.4	85.5	2.7	3.5
40-44.....	8.3	83.1	5.0	3.7
45-49.....	7.9	79.8	8.6	3.6
50-54.....	7.7	75.0	13.9	3.3
55-59.....	7.7	69.1	20.5	2.7
60-64.....	8.2	60.1	29.7	2.1
65-69.....	8.4	48.9	41.1	1.5
70-74.....	9.0	36.6	53.3	1.1
75 and over.....	9.5	18.7	71.2	.6

SOURCE: Table 102 of reference 2.

show a tendency to converge, more so for women than for men. At the older ages there is less difference in mortality between the married and the unmarried. The chart also shows that differences in rates between the married and the unmarried, in each group, are greater for men than for women.

The persistent differences in rates between the married and unmarried suggest that the married state itself may directly affect mortality. However, the available data are not sufficient to shed light on the many questions that would have to be answered before reaching an understanding of the complex factors involved in the differing mortalities of the marital classes.

For each of the four marital classes, as can be seen in table 2, the death rates for men are

higher than those for women in every age group between 20 and 74. The largest relative difference in rate between the sexes appears in each age group under 60 for the divorced and then in each age group 60 and over for the single. The smallest difference appears in each age group for the married. The ratio of the rate for divorced men to that for divorcees climbs from 2.2 at ages 25-34 to 2.9 at ages 45-54 and declines to 1.6 at ages 70-74. The ratio of the rate for bachelors to that for spinsters rises from 1.6 at ages 25-34 to 2.6 at ages 55-59 and then falls to 1.9 at ages 70-74. From 25 to 64 years, in each age group, the rate for widowers is close to double that for widows, and then it declines to 1.5 times at ages 70-74. The death rate for husbands is 1.4 times that for wives at ages 25-34 and 35-44, increases to 1.7 times at ages 55-59, and drops back to 1.4 times at ages 70-74.

A Look Back at 1940

In the United States, more people than ever before are married. In 1890, the earliest year Federal census figures are available for marital status (2), 2 out of 3 persons 20 years or older were married. By 1950 this proportion had increased to 3 out of 4. The big jump in the

percentage married came in the last 10 years—from 68.8 percent in 1940 to 74.2 in 1950. For comparison, the percentage distributions by marital status of the male and female populations 20 years and over are given for 1940 and 1950.

	Male		Female	
	1950	1940	1950	1940
Single.....	17.0	23.9	11.8	17.0
Married.....	76.1	69.7	72.3	68.0
Widowed.....	4.7	5.0	13.3	13.2
Divorced.....	2.2	1.4	2.7	1.9

Among both men and women, with few exceptions, in each 5-year age group from 20 to 84 years, the percent single and percent widowed decreased, and the percent married and the percent divorced increased between 1940 and 1950.

The mortality by marital status for the United States in 1940 based on the 1940 census has been published (1). In the 10 years since 1940 there has been a marked decrease in death rate for both men and women at every age. The number of deaths expected in the standard population aged 20 and over—computed in the same manner as described on page 248—decreased a seventh for men and a fourth for women. The percent changes in expected

Table 2. Death rates by marital status, age, and sex; United States, 3-year average, 1949-51

(Exclusive of deaths among armed forces overseas. Rates per 1,000 population in each specified group enumerated as of April 1, 1950.)

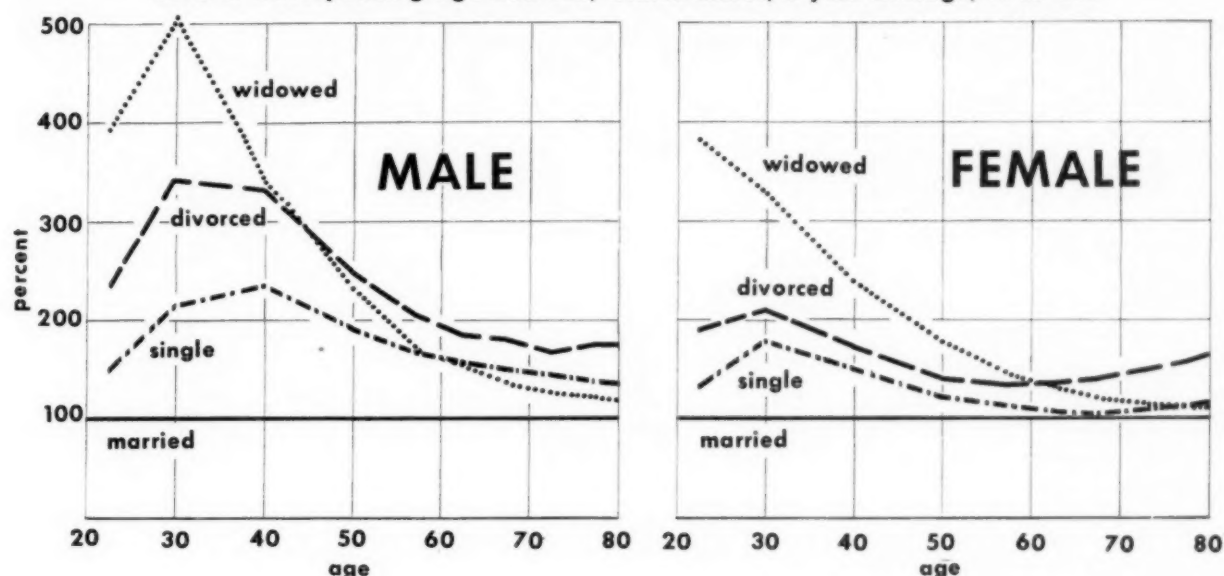
Age (in years)	Male					Female				
	Total ¹	Single	Married	Widowed	Divorced	Total ¹	Single	Married	Widowed	Divorced
All ages ²	11.1	5.4	12.1	70.5	26.1	8.3	3.9	5.8	41.1	8.8
Under 20 ³	3.4	3.4	1.6	2.0	2.3	2.5	2.6	1.0	4.8	1.6
20-24.....	1.9	2.2	1.5	5.7	3.4	1.0	1.2	.9	3.4	1.7
25-34.....	2.2	3.6	1.7	8.6	5.8	1.4	2.2	1.2	4.1	2.6
35-44.....	4.3	8.5	3.6	12.1	11.8	2.9	3.9	2.6	6.2	4.5
45-54.....	10.7	17.8	9.3	21.6	23.2	6.5	7.0	5.7	10.3	8.1
55-59.....	20.0	30.0	17.8	30.4	36.5	11.4	11.5	10.2	14.8	13.8
60-64.....	29.0	41.0	25.8	39.5	48.6	17.5	16.6	15.7	20.7	21.1
65-69.....	41.1	55.0	36.5	50.0	66.1	26.0	24.8	23.5	28.1	33.1
70-74.....	60.4	78.8	54.3	69.1	91.9	43.2	42.3	39.0	44.8	58.2
75 and over.....	119.4	137.3	100.3	139.0	173.3	101.6	103.6	76.0	106.2	129.2

¹ Includes deaths for which marital status was not stated.

² Includes deaths for which age was not stated.

³ Rates for "Total" and "Single" are based on deaths and population at ages 0-19 years. Rates for "Married," "Widowed," and "Divorced" are based on deaths and population at ages 15-19 years.

Age-specific death rates for each marital-sex class as percentages of death rates for married persons of corresponding age and sex; United States, 3-year average, 1949-51.



deaths from 1940 to 1949-51 by marital status were:

	Male	Female
Total.....	-14	-24
Single.....	1	-21
Married.....	-13	-25
Widowed.....	-16	-23
Divorced.....	-16	-33

All but one of the marital-sex classes benefited from the improvement in mortality conditions. Expected deaths for bachelors were about the same in 1949-51 as 10 years ago.

Comparison of the age-specific death rates for 1940 with those for 1949-51 by marital status and sex shows that, except for bachelors, declines were recorded for each marital-sex class at all ages. The percentage changes in death rates between 1940 and 1949-51 are shown in table 3.

Between the two periods, the death rate for women dropped about one-fifth or more for each age group in each marital class, with the greatest drops recorded for the youngest years. At ages 20-34 the rates for wives were cut in half. The death rates for the married, widowed, and divorced men were lower at every age in 1949-51 than in 1940, with the greatest decreases, about a third, recorded for ages under 35. Middle-aged and elderly bachelors did not share in the general mortality improvement of the 10-year period.

The changes in mortality among the marital classes since 1940 can also be seen by comparing the summary measures for 1940 with those for 1949-51 previously described. The 1940 percentages relating the expected number of deaths of each marital-sex class to the expected num-

Table 3. Percentage changes in death rates between 1940 and 1949-51, by marital status, age, and sex: United States

Sex and age (in years)	Single	Married	Widowed	Divorced
<i>Male</i>				
20-24.....	-24	-32	-52	-38
25-34.....	-23	-35	-25	-31
35-44.....	-8	-25	-14	-17
45-54.....	2	-12	-9	-12
55-59.....	5	-7	-13	-7
60-64.....	7	-7	-8	-8
65-69.....	5	-7	-13	-10
70-74.....	5	-10	-13	-20
75 and over.....	4	-12	-14	-19
<i>Female</i>				
20-24.....	-40	-57	-47	-53
25-34.....	-29	-52	-39	-35
35-44.....	-19	-37	-22	-29
45-54.....	-20	-27	-18	-30
55-59.....	-23	-24	-20	-28
60-64.....	-24	-21	-19	-29
65-69.....	-24	-23	-22	-31
70-74.....	-19	-21	-21	-34
75 and over.....	-18	-18	-17	-35

ber of deaths of married persons of the same sex are:

	Single	Married	Widowed	Divorced
Male.....	141	100	192	215
Female.....	117	100	151	173

The relative mortality of the marital classes did not change in the decade following 1940—the lowest mortality was for the married population, the next for the single group, and the highest among the widowed and divorced—but the percentage excesses in the mortality of the unmarried compared with the married shifted somewhat. The excess in the mortality of bachelors over that of husbands is 41 percent for 1940 and 63 percent for 1949–51. The excess in the mortality of spinsters over that of wives is 17 percent for 1940 and 24 percent for 1949–51. The corresponding excesses in mortality of divorced persons and of widowers are smaller in 1949–51 than in 1940; the excesses in mortality of widows are about the same in the two periods. Such changes have probably resulted from changing factors influencing marital status as well as mortality.

Summary

Among both men and women at every age, the married have lower death rates than the single, widowed, or divorced. When allowance is made for the variation in age distribution, the mortality of bachelors is nearly two-thirds greater than that of husbands, and the mortality of widowed and divorced men is about double that of husbands. The differences are not as large for women. The mortality of spinsters is a fourth again as high as that of wives, while the mortality of widows and divorcees is half again as high. The available data do not afford an interpretation of the nature of selection of persons into the marital groups, and the effect of marriage itself on mortality rates.

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Home Safety Booklet Available

An 8-page booklet, entitled "Home Safety Principles," has been prepared from copy published by the National Association of Home Builders in cooperation with the National Safety Council and the Public Health Service in the magazine, *Practical Builder*.

The principles enumerated in this booklet cover general construction and safety inside and outside the house. Specific attention is given to safety matters in the yard, the exterior of the house and garage, roof and chimney, crawl space, kitchen, living, dining and bedrooms, bathroom, closets and storage space, electrical, plumbing, heating, and air conditioning systems. The booklet also features a home safety check list.

Most of the principles can be applied with little or no additional cost. If followed, they should contribute significantly to the reduction of accidental home injuries and deaths.

Copies of the reprint are available from the Division of Engineering Services, Bureau of State Services, Public Health Service, Washington 25, D. C.

A New Organism Resembling *P. tularensis* Isolated From Water

By CARL L. LARSON, M.D., WILLIAM WICHT,
and WILLIAM L. JELLISON, Ph.D.

THE DEMONSTRATION of the presence of *Pasteurella tularensis* in ponds, rivers, and streams in northwestern United States (1) prompted continued study on the distribution of *P. tularensis* in such waters, especially where there have been reports of epizootics in aquatic mammals.

During the course of the studies, an organism, apparently not described in the literature, was detected in a water sample obtained from Utah. The purpose of this paper is to describe this organism, for which we propose the name *Pasteurella novicida* sp. nov. In correspondence and in the exchange of cultures, this organism has been referred to as Utah 112.

Isolation of the Organism

A turbid water sample collected from Ogden Bay Bird Refuge, near Ogden, Utah, was received September 12, 1950, from Dr. Jessup B. Low of the Utah Cooperative Wildlife Research Unit. Muskrats had been found dead in the immediate area where the sample was collected. Two guinea pigs were each injected

intraperitoneally with 10 ml. of this sample, 4 white mice with 2 ml. each intraperitoneally, and 4 white mice with 2 ml. each subcutaneously.

One guinea pig was found dead 6 days after inoculation. Indistinct foci on the liver and spleen were suggestive of tularemia. The other guinea pig, moribund later in the day, was sacrificed and its heart blood placed on glucose-cystine-blood agar. On necropsy, numerous foci of necrosis were observed on the liver and spleen. These lesions were also suggestive of tularemia, and a tentative diagnosis of that disease was made. Cultures from this guinea pig gave pure cultures of the organism under consideration.

One of the mice died on the fourth day post-inoculation and two more on the sixth day. White foci were noted on the spleen of one mouse, and cultures were obtained from the tissues of both mice that died 6 days after injection. The cultures were similar to those isolated from the guinea pig.

Suspensions of the bacterium failed on repeated tests to agglutinate in specific anti-tularensis serum, and tissues of animals which died following injection with the original water sample, as well as tissues from serially infected animals, gave negative Ascoli tests (2) with the same serum.

The failure of the serologic tests to identify the organism as *P. tularensis* was puzzling since the time of death of test animals and the gross

Dr. Larson is the director, Mr. Wicht is a laboratory technician, and Dr. Jellison is the parasitologist, Rocky Mountain Laboratory, National Microbiological Institute, Public Health Service.

lesions were suggestive of tularemia; also, the growth of the organism on glucose-cystine-blood agar and the appearance of the organism from culture and tissue smears, when stained with carbolthionin, greatly resembled *P. tularensis*.

Materials and Methods

The methods used in identification of this organism are largely those recommended in the Manual of Methods for Pure Culture Study of Bacteria (3). However, some variations have been necessary, since the organism does not grow on certain of the media which are ordinarily employed for biochemical tests. Routinely, glucose-cystine-blood agar was used for maintenance of the organism. The proteose-peptone broth of Snyder and his co-workers (4) was employed as the liquid medium. For fermentation tests, filter-sterilized carbohydrates and polyhydroxyalcohols were added in 2-percent concentration, and bromthymol blue was added as indicator. Experimental animals were from stock maintained at the Rocky Mountain Laboratory. Embryonated eggs were inoculated after incubation at 37° C. for 7 days.

Ascoli tests were performed, using bacterial or tissue suspensions treated with ether, according to methods previously described (2).

Organisms used in this study included the bacterium isolated from water from Ogden Bay, *P. tularensis* (strains 453 and 454, which were isolated from streams in the Bitterroot Valley, Mont.), as well as *Pasteurella pestis*, *Pasteurella multocida*, and *Pasteurella pseudotuberculosis*, which are maintained at this laboratory.

Results

The newly isolated bacteria under study are nonmotile, gram-negative rods, which do not form spores. There is some tendency toward bipolar staining, but this is not marked and does not serve as a distinguishing feature. No flagellae are observed. No definite capsule is apparent in preparations from artificial media stained with carbolthionin, Giemsa, or Wayson's stains, although clear areas are observed around cells in smears from tissues of infected animals. In smears prepared from spleens of guinea pigs

and stained with carbolthionin, the organisms are ovoid to coccoid, measure 0.28 μ in length and 0.20 to 0.28 μ in width, and are arranged singly and in small clusters. When grown in liquid media they are 0.7 μ in width and 1.7 μ in length, and are predominantly short, thick rods with slightly bulging sides. They are arranged singly or in pairs. A few coccoid forms are present. If the bacteria are grown in broth containing 3 percent NaCl, the organisms are found to be pleomorphic, and rods as long as 4.2 μ are noted. When grown on solid media, the organisms measure 0.47 μ to 0.94 μ in length and 0.47 μ in width. These examinations were made by phase microscopy with organisms grown at 37° C. for 24 or 48 hours. Broth cultures were examined for motility after incubation for 18, 24, and 48 hours at 25° C. and 37° C., by both light- and dark-field microscopy.

On primary isolation, the culture grows well on glucose-cystine-blood agar, but not on nutrient agar (Difco). Cultures made directly from animal tissues by smearing liver or spleen upon the surface of horsemeat-infusion agar do not grow except in the immediate vicinity of small pieces of tissue that adhere to the medium. After 11 serial passages in guinea pigs, *P. novicida* still could not be isolated on media lacking added cystine, yeast extract, or whole blood. Plating of serial dilutions on the surface of various media indicates that glucose-cystine-blood agar, glucose-cystine agar, blood agar, or yeast-extract agar are about equally suitable media. No growth occurred in plain horsemeat-infusion agar, with or without addition of dextrose, even when as many as 50,000 organisms were present in the inoculum.

On glucose-cystine-blood agar, well-separated colonies may attain 8 mm. in diameter after 72 hours' incubation. They are gray with a definite blue cast, smooth, slightly elevated, glistening, amorphous, and have entire edges. The colonies are butyrous or viscid and are easily emulsified in water to form a homogeneous suspension. Colonies average about 4 mm. in diameter on blood agar but otherwise resemble those described above. On glucose-cystine agar, they average 6 to 7 mm. in diameter and are translucent. On yeast-extract agar, the colonies are about 3 mm. in diameter, clear, convex, glistening, and with smooth edges. Growth

is moderate in 24 hours at 37° C. on slanted media, and isolated colonies have characteristics similar to those described for each of the above media. The growth is filiform and tends to pile up at the edges. There is no hemolysis on blood agar.

In deep agar shakes of media containing yeast extract or cystine incubated for 8 days at room temperature at 30° C. and 37° C., the organisms grow on the surface and to a depth not exceeding 0.7 cm. below the surface. The surface colonies approximate 5 mm. in diameter whereas those growing within the agar are 1 mm. or less.

In the fluid medium employed (4), growth is abundant, producing a moderately uniform turbidity. There is no pellicle or surface growth. A slight deposit develops, which may be disintegrated by shaking. No growth can be seen on raw potato.

Fermentation

The first isolate of *P. novicida* was found to ferment dextrose, sucrose, levulose, and mannose, with production of acid but no gas. A culture isolated from the 11th passage in guinea pigs was tested in Snyder's medium containing 2-percent concentrations of the various substrates and bromthymol blue to determine the fermentative reactions of the organism. The medium was dispensed in 25-ml. volumes in 100-ml. flasks and incubated at 37° C.

Two cultures of *P. tularensis* (isolates 453 and 454) were studied under identical circumstances. Each flask of medium was inoculated with 1 ml. of suspension of organisms grown in Snyder's medium for 24 hours at 37° C. Flasks of Snyder's medium were included as uninoculated controls and flasks containing indicator but no added substrate served as inoculated controls. The color changes were noted and the pH determined, with the aid of a pH meter, 4 and 14 days after incubation. The results of pH determinations are presented in table 1.

Additional carbohydrates and polyhydroxy-alcohols not included in the table were tested. These were inulin, rhamnose, trehalose, sorbitol, arabinose, adonitol, dextrin, melizitose, salicin, inositol, xylose, lactose, esculin, raffinose, galactose, mannitol, and dulcitol. The final pH attained by media containing these substances was 7.3 to 7.6 for *P. tularensis* isolate 453, 7.4 to 7.8

Table 1. Comparative fermentation studies on *Pasteurella tularensis* and *Pasteurella novicida*

Substrate	pH reactions of media after 4 and 14 days' incubation with—					
	<i>P. tularensis</i> (453)		<i>P. tularensis</i> (454)		<i>P. novicida</i>	
	4 days	14 days	4 days	14 days	4 days	14 days
Sucrose...	7.6	7.5	7.6	7.6	5.6	5.5
Dextrose...	6.9	6.5	6.9	6.8	5.7	5.6
Levulose...	6.6	5.8	6.5	6.2	5.7	5.2
Mannose...	6.9	6.7	6.9	6.6	5.8	5.5
Glycerol...	7.6	7.6	7.5	7.6	7.3	6.9
Maltose...	7.6	7.5	7.6	7.6	7.7	7.6
Inoculated control...	7.5	7.5	7.5	7.6	7.7	7.7

for *P. tularensis* isolate 454, and 7.4 to 7.7 for *P. novicida*. Fermentation of sucrose by *P. novicida* serves to differentiate it from *P. tularensis*.

The effect of fermentable sugars upon the growth of the organism was determined. Cultures were made in Snyder's medium containing dextrose, sucrose, maltose, and lactose, all with bromthymol blue as indicator. After 3 days' incubation at 37° C., when the color of the medium indicated that fermentation of dextrose and sucrose had taken place, serial tenfold dilutions were made of the bacterial suspensions, and counts were made on glucose-cystine-blood agar. The bacterial counts of each of the media were in very close agreement, being 25×10^8 and 27×10^8 for media containing dextrose and sucrose, respectively, and 24×10^8 and 19×10^8 for those with maltose and lactose, respectively. Thus, the presence of fermentable sugars had no effect on the growth of *P. novicida*.

Biochemical Reactions

The following biochemical reactions were observed: nitrates not reduced to nitrites; indol negative by Kovac's method; H₂S positive by lead acetate paper strips; ammonia not produced; methylene blue reduced, catalase positive; gelatin contained no added cystine supported growth but was not liquefied; litmus milk unchanged; methyl red and Voges-Proskauer negative, although growth was manifest

in the medium; no growth on McConkey's medium.

The resistance of the organism, comparable to that of *P. tularensis*, is not great. Suspensions containing 4×10^8 bacteria in saline were killed in 10 minutes by exposure to a temperature of 60° C. and in 20 minutes by exposure to 1 percent phenol. Cultures of *P. novicida* and *P. tularensis* (453 and 454) were grown on glucose-cystine-blood agar at temperatures of 25°, 32°, 37°, and 41° C. Three subcultures were made during an observation period of 16 days. None of the strains of organisms was affected by exposure to the limits of temperature selected since there was confluent growth on each of the agar slants at the termination of the experiment.

No evidence for the presence of a soluble toxin or for the filterability of the organism was found. A culture of the organism was grown in Snyder's medium at 37° C. for 48 hours and filtered through a sintered glass filter (grade UF). The first aliquot of 10 ml. was discarded. The remainder of the filtrate was collected and tested for sterility. No growth occurred on glucose-cystine-blood agar plates or on Snyder's medium. Mice and guinea pigs inoculated intraperitoneally with 0.1 and 5.0 ml., respectively, of this filtrate were not infected.

Pathogenicity

P. novicida is pathogenic for a wide range of experimental animals. The pathogenicity for white mice and guinea pigs is shown in table 2. As few as 50 organisms injected subcutaneously into mice caused death, whereas as few as 5 organisms administered intraperitoneally caused death in 3 of 4 mice. Small numbers of organisms were also shown to be lethal for guinea pigs by intraperitoneal injection. Hamsters were as susceptible as mice and guinea pigs and showed more distinctive gross lesions. Titrations of cultures and tissues from infected animals or embryonated eggs demonstrated that suspensions containing two bacteria, as determined by growth on glucose-cystine-blood agar plates, were capable of producing lethal infections in 7-day-old embryonated eggs. The disease produced in embryos was fatal within 2 to 7 days.

There was considerable resistance to infection in rabbits, white rats, and pigeons, and

Table 2. Mortality among groups of white mice and guinea pigs inoculated with a suspension of spleen from a guinea pig dying during the 10th serial passage of *Pasteurella novicida* in guinea pigs

Animal and route of inoculation ¹	Dilution of spleen suspension ²	Amount injected (ml.)	Approximate number of organisms	Results ³
<i>White mouse</i>				
IP	10 ⁻¹	0.2	5,000	4/4
IP	10 ⁻²	.2	500	4/4
IP	10 ⁻³	.2	50	4/4
IP	10 ⁻⁴	.2	5	3/4
SQ	10 ⁻¹	.2	5,000	4/4
SQ	10 ⁻²	.2	500	3/4
SQ	10 ⁻³	.2	50	4/4
SQ	10 ⁻⁴	.2	5	0/4
IM	10 ⁻¹	.1	2,500	4/5
IC	10 ⁻¹	.03	Ca 800	5/5
<i>Guinea pig</i>				
IP	10 ⁻¹	0.2	5,000	4/4
IP	10 ⁻²	.2	500	4/4
IP	10 ⁻³	.2	50	4/4
IP	10 ⁻⁴	.2	5	0/4
SQ	10 ⁻¹	.2	5,000	4/4
SQ	10 ⁻²	.2	500	4/4
SQ	10 ⁻³	.2	50	4/4
SQ	10 ⁻⁴	.2	5	2/4

¹ IP, intraperitoneal; SQ, subcutaneous; IM, intramuscular; IC, intracerebral.

² No deaths among animals inoculated with 10⁻⁵, 10⁻⁶, or 10⁻⁷ dilutions.

³ Numerator, number died; denominator, number inoculated.

large numbers of organisms were needed to produce signs of illness and death. Six million organisms caused death within 4 days of three pigeons inoculated intramuscularly, but 6×10^5 organisms failed to produce illness in a similar group of birds. Rabbits infected with as few as 3×10^4 organisms succumbed if inoculated either intraperitoneally or subcutaneously, but some lived as long as 25 days. White rats were susceptible to large doses of organisms administered intraperitoneally (3×10^7) but not to similar amounts given subcutaneously.

There were no pathognomonic lesions in embryonated eggs examined after death of the embryo, but hemorrhages and congestion were commonly noted. Mice inoculated subcutaneously showed congestion of the subcutaneous tissues, hemorrhages at the site of inoculation, with enlargement and congestion of the local lymph nodes, hemorrhages and congestion of

the lungs, and enlargement of the spleen, with multiple small foci of necrosis. There were no gross lesions in the liver. The subcutaneous tissue of guinea pigs was hemorrhagic and congested, the local lymph nodes were enlarged and hemorrhagic, the spleen was enlarged, containing many small, raised gray foci of necrosis and was usually covered with a gray exudate. The liver contained few to many foci of necrosis. The lungs were congested and hemorrhagic and exhibited foci of necrosis in many instances. The lesions noted in rabbits, white rats, and hamsters were essentially similar to those noted in white mice and guinea pigs. In one rabbit, surviving for 25 days after infection, many large caseous areas of necrosis were found in the lungs.

Serologic Reactions

Agglutination and precipitin tests were performed with serums from rabbits immunized by repeated intravenous inoculation of formalin-killed suspensions of *P. tularensis*, *P. novicida*, *P. pestis*, *P. pseudotuberculosis*, and *P. multocida*. A formalin-killed suspension of each of the organisms was employed for agglutination tests. Precipitin tests were done with the supernatant fluid obtained after suspensions of the organisms in saline had been treated with two volumes of ether, and the aqueous phase centrifuged and harvested (2). The tests were incubated at 37° C. for 4 hours and placed in the refrigerator overnight before being read the following morning.

It was found that formalin-killed suspensions of *P. novicida* reacted in the agglutination test with serum prepared against the homologous organism but not with serums prepared against the heterologous organisms. Similarly, the immune serum prepared against *P. novicida* agglutinated suspensions of *P. novicida* to a titer of 1:320, *P. tularensis* and *P. pseudotuberculosis* to titers of 1:10 only and failed to react with *P. pestis* and *P. multocida*.

The several serums were tested for the presence of precipitins against *P. novicida*. The *P. novicida* antigen employed failed to react with serums from rabbits immunized with *P. pseudotuberculosis* and *P. multocida*, but reacted with undiluted serums specific for *P.*

pestis and *P. tularensis* and to a titer of 1:32 against homologous serum. The anti-novicida serum precipitated with antigens derived from *P. pestis* and *P. tularensis* in dilution of 1:4, from *P. pseudotuberculosis* to a dilution of 1:2, from *P. novicida* to a titer of 1:32, and failed to precipitate antigen from *P. multocida*. When dilutions of antigen prepared from *P. novicida* were tested against whole serums in the precipitin test, the antigen did not react with serums specific for *P. multocida* and *P. pseudotuberculosis* but reacted at dilutions of 1:4 with serums against *P. pestis* and *P. tularensis* and at a dilution of 1:64 against the homologous serum. In general, the serums from rabbits immunized against formalin-killed antigens gave specific reactions in both agglutination and precipitin tests.

Precipitin tests were performed with serums from rabbits immunized with suspensions of *P. novicida* and *P. tularensis* killed: (a) by heating at 60° C. for 30 minutes, (b) by addition of 2 volumes of ether, and (c) by 0.2 percent formalin or 0.5 percent phenol. Antigens were obtained by extraction with ether. The results given in table 3 indicate that the antibodies produced are relatively specific for each bacterial species and do not appear to be significantly varied by the type of treatment afforded the antigen employed to immunize the animals.

Table 3. Results of precipitin tests with serums of rabbits sensitized with variously treated antigens

Type and serum No.	Method of killing	Titer of reaction with antigen from—	
		<i>P. novicida</i>	<i>P. tularensis</i>
<i>P. novicida</i>			
9650-----	Ether-----	1:32	1:4
9651-----	do-----	1:32	1:1
9652-----	Heat-----	1:128	1:4
9654-----	Formalin-----	1:64	1:2
9655-----	do-----	1:128	1:2
9657-----	Phenol-----	1:128	1:2
<i>P. tularensis</i>			
9658-----	Ether-----	1:8	1:128
9662-----	Formalin-----	1:4	1:128
9665-----	Phenol-----	1:2	1:64

Discussion

The organism described has certain characteristics that indicate a relation to the organisms contained in the family Parvobacteriaceae, but it cannot be associated directly with any of the various tribes within the family. Morphologically, it has considerable resemblance to *P. tularensis*, being similar in microscopic appearance, in showing considerable dependence upon growth factors in blood, yeast extract, or cystine, and in characteristic colonial growth on glucose-cystine-blood agar. The lesions produced in experimental animals and the wide range of hosts susceptible to infection increase the apparent resemblance. Both may be found in natural waters of the western States. They differ markedly, however, in immunological characteristics and may be distinguished by either agglutination or precipitin tests. In addition, *P. novicida* ferments sucrose, whereas *P. tularensis* does not.

There has been considerable discussion as to whether or not the etiological agent of tularemia is justifiably included in the genus *Pasteurella*. At present, it would appear best to leave it in the genus *Bacterium* until its taxonomic position is clarified. We would prefer to place the newly isolated organism in the genus *Bacterium* for the same reason. However, the genus name *Bacterium* is a "rejected generic name" by recent (1954) action of the International Committee on Bacteriological Nomenclature (5) so it is not available. The only alternative to the use of *Pasteurella* would be to establish a new genus name for the two organisms. This we are not prepared to do at this time.

Further examination of natural waters in the western United States, including Ogden Bay, has not resulted in additional isolations of *P.*

novicida. Many cultural studies of the laboratory animals maintained at the Rocky Mountain Laboratory have not revealed the organism to be present in the animal colonies, justifying the conclusion that the isolation of *P. novicida* from guinea pigs and mice inoculated with water represented a valid isolation from the water sample involved.

Summary

A micro-organism highly pathogenic for mice, hamsters, guinea pigs, and rabbits has been isolated from a water sample collected in Ogden Bay, Utah. In gross appearance of cultures, microscopic appearance, and pathogenicity, it closely resembles *Pasteurella tularensis*. It may be distinguished, however, from *P. tularensis* by fermentation studies and by serologic tests. The organism is described and the name *Pasteurella novicida* sp. nov. is proposed.

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Rheumatic Fever Management

Notes on a panel discussion at the Second World Congress of Cardiology, Washington, D. C., September 14, 1954. Chairman, T. Duckett Jones, M.D., medical director of the Helen Hay Whitney Foundation, New York City (died November 22, 1954). Co-chairman, Maurice Campbell, M.D., London, England. Panel members: Edward F. Bland, M.D., Massachusetts General Hospital, Boston. Albert Dorfman, M.D., Chicago. John D. Keith, M.D., Toronto, Canada. Charles H. Rammelkamp, M.D., Cleveland, Ohio.

. . .

IS RHEUMATIC FEVER declining in prevalence and incidence? Clinical evidence, such as the relatively rare occurrence of severe chorea, or St. Vitus' dance, suggests a decline in severity. Statistical evidence, such as the decline in cases in all age groups reported in Toronto by Dr. John D. Keith, suggests a decline in prevalence. The accompanying chart, prepared by the National Heart Institute of the Public Health Service, also suggests a decline in the number of cases and severity of rheumatic heart disease. Nevertheless, Dr. T. Duckett Jones observed that the apparent decline may result from improved environmental conditions, such as heating and nutrition, rather than from any genuine change in the organic process. He stated there has been no change in the ability to contract rheumatic fever. And he felt the decline in cases may be more apparent than real. As he put it, when successful heart surgery was announced, rheumatic cardiac cases more often sought relief and advice. He believed that a decrease in crowding in the home has reduced exposure to streptococcal infections. It was noted also that the use of antibiotics has greatly lessened the incidence and possibly the duration of recurrences.

Diagnosis

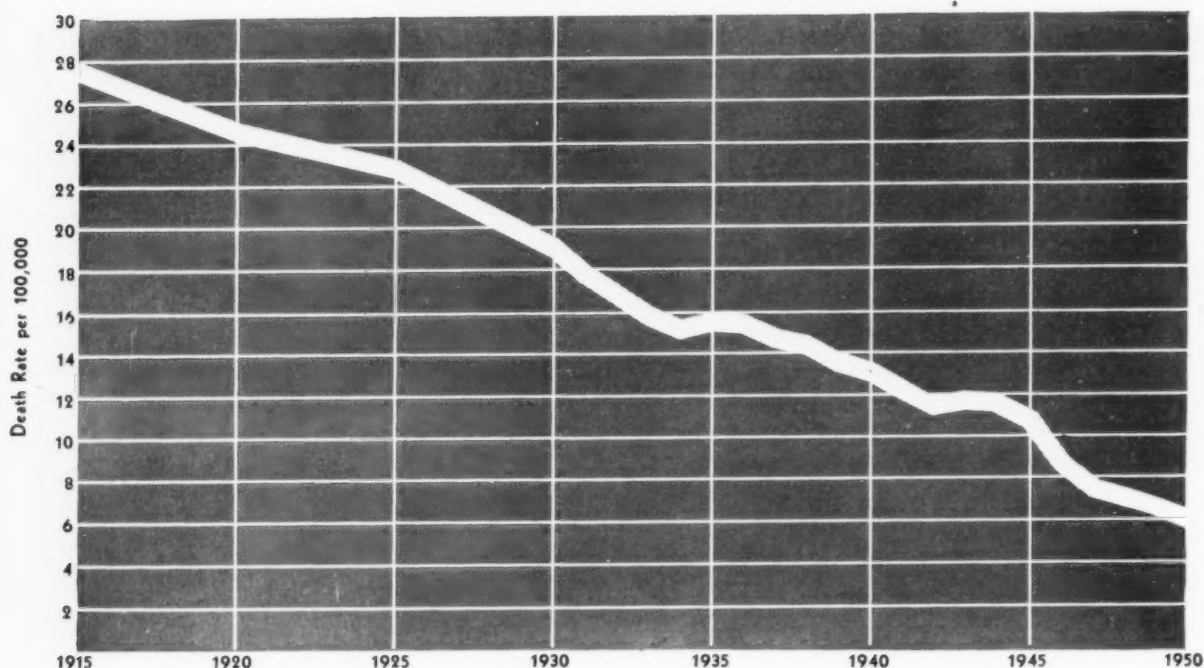
With regard to methods of diagnosing rheumatic fever, the panel agreed that no specific laboratory test is entirely satisfactory. It concluded that, although sedimentation rate tests were very helpful, accurate diagnosis still depends primarily upon direct evidence of the patient's condition and history. However, it was noted that many patients with serious rheumatic heart disease give no history of the swelling, redness, and pain of the joints which are often typical clinical symptoms. For this reason, considerable interest was expressed in the work of Dr. May Wilson, who has undertaken to determine whether fluoroscopic observation of progressive enlargement of the heart chambers may be a practical diagnostic aid. The panel seemed to agree that a thin, pinched, weary appearance in the child is a distinct clue to rheumatic fever activity.

Dr. Edward F. Bland reported that of 1,000 rheumatic fever patients observed since childhood in the past 20 years somewhat fewer than a third had died. Of these, 80 percent had died of congestive heart failure. Ten percent had died of acute or subacute bacterial endocarditis. The remainder had died of other causes, about half of which were not related to the chronic affliction. He observed also that the surviving patients had been treated successively by salicylates, sulfadiazine, and penicillin, and that many now might have their health and expectancy protected by valve surgery.

Control

Dr. Charles H. Rammelkamp asserted that when sulfadiazine or penicillin failed to prevent rheumatic fever the failure often lay with the patient's refusal to follow prescribed orders rather than with the effects of the compounds.

Heart disease (mainly rheumatic) and rheumatic fever, age-specific death rates per 100,000 persons aged 5-24, United States, 1915-50.



He asserted also that, since the average child experiences a streptococcal infection about once every 4 or 5 years, the best method of preventing rheumatic fever, a potential result of any streptococcal infection, is to eradicate the streptococci. Such eradication can be achieved by administering compounds not only to the infected child but also to other exposed members of the family. He noted that sulfadiazine used against the streptococcal infection is ineffective against a rheumatic fever attack. Penicillin is the drug of choice.

Dr. Jones commented that a statement on prophylaxis for rheumatic fever, issued by the American Heart Association, is being revised and that a new statement is forthcoming. It was advised that administration of a depositional form of penicillin about a month prior to a valve operation for rheumatic fever patients might protect against postoperative flareup of the disease.

Fundamental Studies

Immediately before the panel discussion, Dr. Lewis Thomas of Minneapolis described studies which explored the fibrinoid processes involved in rheumatic fever, lupus erythematosus, and related collagen diseases.

The process which develops from a streptococcal infection and leads to rheumatic fever and cardiac injury was the subject of a paper presented at the congress by Dr. Aaron Kellner and Dr. Theodore Robertson of New York. They observed that a proteolytic enzyme produced by many strains of group A streptococci acts as a powerful poison upon the heart. This enzyme was isolated in crystalline form by Dr. Stuart Elliott of the Rockefeller Institute.

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NOTE: The American Heart Association's revised statement on rheumatic fever prophylaxis will appear in the April issue of *Public Health Reports*.

Important implications for civil defense lie in this study of 6,343 case histories of radiation injuries, flash burns, lacerations, and contusions—received outdoors or indoors within a 2.3-mile radius of ground center.

Atomic Bomb Injuries Among Survivors in Hiroshima

By MARDELLE L. REYNOLDS, A.B., and FRANCIS X. LYNCH

THE PRIMARY PURPOSE of this paper is to present the results of a study of atomic bomb injuries in relation to the type of protection of survivors who were at varying distances from the ground center of the explosion in Hiroshima, Japan, on August 6, 1945. An analysis has been made of the clinical histories of 5,136 injured persons and interviews with 1,207 uninjured persons exposed to the bomb. These histories and records of interviews were collected by physicians of the Joint Army-Navy Commission which investigated the medical effects of the bomb within a few months after the explosion (1).

Limitations of the Data

It is recognized that no statistical study of the types of injury incurred as a result of the

atomic bombing in Hiroshima can be fully representative of those actually sustained in that city. Authorities agree that no accurate count of the exact number of dead and injured will ever be possible and that causes of death in the areas of greatest destruction can only be estimated. Since the individuals in our study include only those who survived the disaster and were able to escape from the damaged areas of the city alone or with assistance of others, the distribution and severity of injuries in this group may be expected to differ from estimated causes of immediate death.

The total population of Hiroshima at the time the bomb was dropped and the number of injured survivors have been variously estimated. One such estimate (2) places the population figure at 245,000 with equal numbers—70,000 to 80,000 each—injured and killed, or missing and presumed to be dead. If these figures may be regarded as reasonably accurate, our study comprises a maximum 7.3 percent sample of injured survivors and 1.1 percent of the uninjured—a figure of 98,265 exposed individuals residing in Hiroshima in 1950 was obtained from the Atomic Bomb Casualty Commission's survivor questionnaire, circulated with the Japanese national census of October 1, 1950 (3).

Some bias may exist in our sample, because of the fact that many survivors, both injured

Mrs. Reynolds is chief of the Statistics Branch, Armed Forces Institute of Pathology, with which she has been associated since 1946. Earlier she was with the Selective Service System, part of the time as adviser to the director. Also with the Institute, Mr. Lynch is chief of the Atomic Unit, Radiation Injury Pathology Section. He was with the Foreign Liquidation Branch, Department of State, from 1946 to 1947.

and uninjured, left the city soon after the bombing, and the fact that an unknown number of the injured may have died elsewhere. However, an indication that many of those who fled the city had returned by the time of the interviews is afforded by the fact that the population of Hiroshima had reached 137,000 by November 1, 1945.

A long-range followup of the effects of the detonations on survivors and their descendants may alter some of the data as to actual distance of survivors from the ground center of the explosion. It is possible that the earlier interviewers' estimates of distances at specified locations reported by those interviewed were calculated hurriedly or without the aid of detailed maps which were available to later investigators.

On the other hand, persons interviewed immediately or within a short time after may have given a more nearly accurate description of their positions at the time of the bombing than at subsequent interviews when accounts given by other exposed individuals might have come to be identified as their own experiences. For this reason and also because no similar data based on the interviews by the Joint Army-Navy Commission appear to have been published, it was considered desirable to study the types of injuries in relation to the distances and the type of shelter or lack of shelter afforded the survivors.

A recent semiannual report of the Atomic Bomb Casualty Commission (4) states that "1,009 individuals surviving under 1,000 meters

and 9,191 between 999 and 1,499 meters were located during the Japanese national census in 1950." The Joint Army-Navy Commission sample includes 816 persons who were recorded as being within 1,000 meters from ground center of the explosion, 306 of whom died after admission to hospitals. At the distance of 1,001 through 1,500 meters, the sample shows 1,134 persons, 1,081 of whom were living several weeks to months after the bombing.

General Characteristics of the Sample

The total case records included in this study number 6,343. These include 5,136 injured persons, 384 of whom died in hospitals where their histories were obtained, and 1,207 who were uninjured. All these persons reported that they were within a radius of 13,120 feet from the ground center of the explosion. Not included in the study are a small number of uninjured persons within this distance who were in tunnels or air raid shelters and 229 who were at distances ranging from 13,121 to 16,400 feet from ground center.

The distance, in feet, of the injured and uninjured persons from the ground center of the explosion is shown in table 1. The percentages of uninjured persons increased with increasing distance from ground center as would be expected. The 5,136 injured persons comprise 81 percent of the total.

Four types of protection, or lack of protection, were coded by the original investigating groups and tabulated in relation to the 6,343 persons

Table 1. Injured and uninjured persons in Hiroshima sample study in relation to distance from ground center of explosion

Distance (in feet)	Total	Injured				Uninjured	
		Alive		Dead			
		Number	Percent	Number	Percent	Number	Percent
3,280 or less	816	500	61	306	38	10	1
3,281-6,560	2,844	2,465	86	74	3	305	11
6,561-9,840	2,122	1,564	74	¹ 4	(²)	554	26
9,841-13,120	561	223	40			338	60
Total	6,343	4,752	75	¹ 384	6	¹ 1,207	19

¹ Includes 1 dead, no injury recorded.

² Less than 0.5 percent.



Armed Forces Institute of Pathology photographs



Government Prefectural Office before and after the explosion occurring August 6, 1945 (2,952 feet).



Communications building (4,592 feet). General view looking away from the center.



An example of destruction of wooden buildings by the A-bomb explosion at a point 13,120 feet from the center of the explosion. Photograph was taken at 8:00 a. m. August 10, 1945.

for whom these data were obtained. These categories are: (a) outdoors and unshielded, (b) outdoors, shielded, (c) indoors in buildings of light construction, defined for convenience as Japanese-type buildings, and (d) indoors in heavy buildings of reinforced concrete, some of which were earthquake resistant, and steel frame industrial buildings.

A total of 2,690 persons, 42 percent of those in our series, were recorded as being out of doors at the time of explosion. More than three-fourths of these, 2,040 persons, were presumably not protected by any type of shelter; the remainder were shielded chiefly by buildings.

Of the 3,653 persons (58 percent of those in this series) who were indoors, approximately 89 percent, 3,249 persons, were in buildings of light (Japanese-type) construction, and the remaining 11 percent were in heavy buildings.

This low percentage of survivors who were in heavy buildings may have been due both to the fact that comparatively few heavy buildings were in the area of greatest destruction and to the crushing or pinning of persons in such buildings by heavy beams or falling plaster, with death by fire following almost immediately.

The United States Strategic Bombing Survey reported that (2), "the entire heart, the main administrative and commercial as well as residential section, was gone. In this area only

about fifty buildings, all of reinforced concrete, remained standing. All of these suffered blast damage and all save about a dozen were almost completely gutted by fire; only five could be used without major repairs."

The destruction of buildings in the urban area was officially announced by Japanese authorities as 62,000 of a total of 90,000, or 69 percent, with another 6,000, or 6.6 percent, severely damaged (5). The area of severe damage by fire was about 4.4 square miles (6).

Only 47 of the 1,207 uninjured persons interviewed were in heavy buildings at the time the bomb exploded (table 2). Forty-nine of the 404 survivors, or 12 percent, who escaped from heavy buildings died after being hospitalized, as compared with 335, or 6 percent, of the persons in other locations.

Types of Injury Indoors and Outdoors

Only three types of injury were encountered in the survivors interviewed:

More than one-half of 5,136 injured persons had mechanical injuries.

These injuries consisted of lacerations and contusions caused by flying glass and debris, falling walls, plaster, and other materials. No fractures were reported. This absence of fractures is explained in a report of Liebow, War-

Table 2. Type of protection in relation to physical status of persons exposed to the atomic bomb in Hiroshima

Type of protection	Total		Injured				Uninjured	
			Alive		Dead			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Outdoors: ¹								
Unshielded.....	2, 040	76	1, 754	79	74	80	212	55
Shielded.....	650	24	460	21	18	20	172	45
Total.....	2, 690	100	2, 214	100	92	100	384	100
Indoors: ²								
Japanese-type building.....	3, 249	89	2, 230	88	243	83	776	94
Heavy building.....	404	11	308	12	49	17	47	6
Total.....	3, 653	100	2, 538	100	292	100	823	100
Grand total.....	6, 343		4, 752		384		1, 207	

¹ Percent outdoors, 42.

² Percent indoors, 58.

Figure 1. Percentage of injured persons with radiation, mechanical injury, and burns

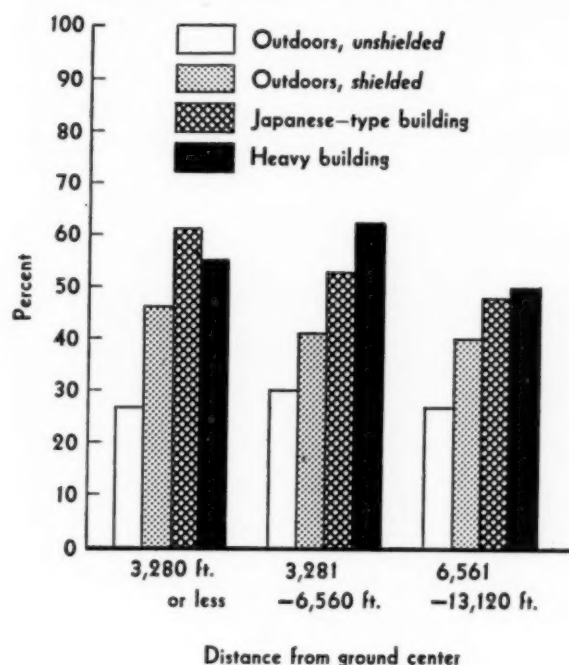
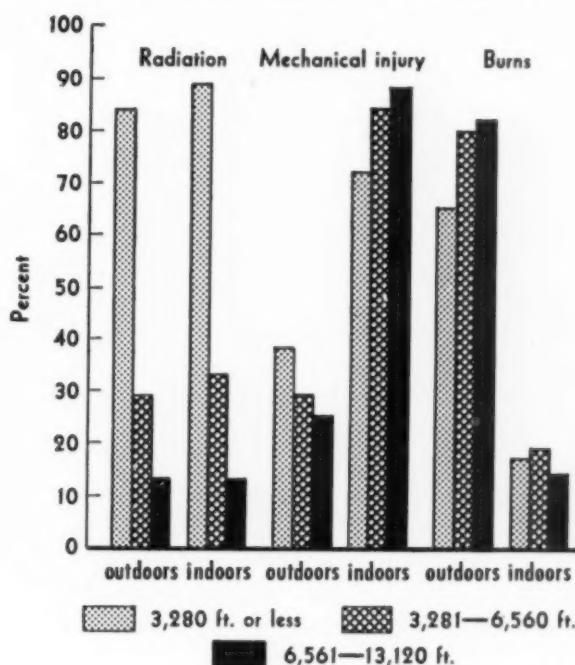


Figure 2. Percentage of persons with mechanical injuries whose injuries were severe



ren, and DeCoursey (7), which states that among survivors seen in Hiroshima 2 months after the bombing, the incidence of fractures was less than 4.5 percent—not because such injuries were few but rather that almost none who had lost the capacity to move escaped the flames.

Forty-five percent of the injured persons had burns.

All except 3 of these were the result of thermal radiation, although 8 persons with flash burns also had flame burns from clothing which ignited. Investigation indicated that the majority of the flash burns, as well as all the flame

burns, were of second or third degree, and usually were confined to the extremities. Support of this observation concerning survivors is found in the report of the Tokyo Army Medical College (8), which states:

“The degree of burn might be expected to be relative to the distance and presumably those near bombing center should be of greater degree. But it was a fact that survivors near the center of bombing had either no burns or burns of small areas. Investigation of the survivors failed to reveal any relation between the degree of burns and the distance from the center.”

Table 3. Incidence of injuries of 5,136 persons injured by the atomic bomb in Hiroshima in relation to location at time of bombing

Type of injury	Total	Outdoors		Indoors	
		Number	Percent ¹	Number	Percent ¹
Total injured.....	5, 136	2, 306	45	2, 830	55
Mechanical injury, alone or with other injuries.....	2, 977	643	28	2, 334	82
Radiation, alone or with other injuries.....	1, 732	633	27	1, 099	39
Burns, alone or with other injuries.....	2, 322	1, 846	80	476	17

¹ Percentages in this table add to more than 100 since many persons had more than 1 type of injury.

Table 4. Location and type of protection and distance from ground center of explosion in relation to incidence of injuries ¹

Location and protection	Total injured	Percent of injured with—		
		Radiation	Mechanical injury	Burns
3,280 feet or less				
Outdoors:				
Unshielded.....	128	82	28	76
Shielded.....	62	88	55	43
Indoors:				
Japanese-type building.....	471	92	70	15
Heavy building.....	145	77	80	22
3,281-6,560 feet				
Outdoors:				
Unshielded.....	922	27	20	91
Shielded.....	290	39	59	47
Indoors:				
Japanese-type building.....	1,139	34	84	19
Heavy building.....	188	24	87	19
6,561-13,120 feet				
Outdoors:				
Unshielded.....	778	12	19	90
Shielded.....	126	17	59	43
Indoors:				
Japanese-type building.....	863	13	87	14
Heavy building.....	24	17	88	13

¹ Percentages add to more than 100 since many persons had more than 1 type of injury.

Effects of radiation were encountered in 34 percent of the injured persons.

As would be expected among individuals who survived for several weeks or months, the radiation was more often described as moderate than as severe. We have previously reported that 18 survivors who were reported as outdoors and unshielded within 3,280 feet of ground center had symptoms indicating only moderate radiation sickness (9).

No blast injuries were noted in the persons seen by the Joint Commission physicians, nor, according to the Tokyo Army Medical College (8), were there many survivors with internal

injuries and blood vessel injuries. The possibility of death from central nervous system injury resulting in pulmonary edema and hemorrhage among persons in close proximity to walls or the ground in cases where the blast would strike the surface square on is suggested by Cas-sen, Kistler, and Mankiewicz (10), on the basis of experimental data.

The breakdown of injuries by location (table 3) shows that mechanical injuries occurred in 82 percent of the injured survivors who were inside buildings as compared to 28 percent of those who were outdoors. In contrast, flash burns were reported for 17 percent of the survivors indoors and 80 percent of those outdoors. Radiation effects were noted chiefly among survivors near the ground center, where gamma rays penetrated buildings and where instantaneous deaths from massive radiation may have occurred among persons unprotected by buildings. This may account for the higher percentage of radiation injury among survivors indoors than among those who were outdoors.

The incidence of injuries among injured survivors at different distances from ground center is considered with respect to type of protection

Table 5. Types of single and multiple injuries of 5,136 injured persons

Type of injury	Total	Distance from ground center (feet)			
		3,280 or less	3,281-6,560	6,561-13,120	
Total injured.....	5,136	806	2,539	1,791	
Percent of total					
Mechanical:					
Alone.....	33	8	33	43	
With radiation.....	14	42	13	4	
With burns.....	7	2	8	8	
With both.....	4	11	4	1	
Total.....	58	63	58	56	
Burns:					
Alone.....	27	3	27	36	
With radiation.....	7	12	9	3	
Total.....	34	15	36	39	
Radiation alone.....	8	22	6	5	

Table 6. Location, type of shelter, and distance from ground center of explosion in relation to type of injury

Location and shelter	Total (100 per- cent)	Percent in group						
		Mechanical injury				Radiation		Burns alone
		Alone	With burns	With radia- tion	With burns and radia- tion	Alone	With burns	
3,280 feet or less								
Outdoors:								
Unshielded	128	1	4	9	14	14	45	13
Shielded	62	7	-----	29	19	21	19	5
Indoors:								
Japanese-type building	471	6	2	53	9	26	4	(1)
Heavy building	145	19	3	43	15	16	3	1
3,281-6,560 feet								
Outdoors:								
Unshielded	922	5	9	2	4	2	19	59
Shielded	290	29	9	15	6	9	9	23
Indoors:								
Japanese-type building	1, 139	53	7	21	3	7	3	5
Heavy building	188	61	9	14	3	6	1	6
6,561-13,120 feet								
Outdoors:								
Unshielded	778	7	9	1	2	3	6	72
Shielded	126	41	10	8	-----	8	1	32
Indoors:								
Japanese-type building	863	75	6	6	1	5	1	6
Heavy building	24	71	8	8	-----	8	-----	5

¹ Less than 0.5 percent.

or lack of protection in table 4 and for the percentages outdoors and indoors in figure 1. Radiation injury was found generally unrelated to type of protection, and there was rapid fall-off from the first distance zone outward.

Mechanical injuries were definitely related to the amount of protection afforded. Whereas no more than 28 percent of the survivors who were outdoors and unshielded in any distance zone had such injuries, the percentages with mechanical injuries who were indoors in heavy buildings ranged from 80 to 88 percent. Of interest also are the statistically significant higher percentages of mechanical injuries among persons injured outdoors in each zone who were presumably "shielded" than among those outdoors and unshielded.

The highest incidence of burns occurred in the second distance zone and beyond. Forty-

eight percent of all the injured survivors at 3,281-6,560 feet and from this zone outward had burns, as compared with 28 percent of those nearest ground center. (Burns occurred in only 17 percent of the victims at the 9,841 to 13,120 feet distance.) However, 76 to 91 percent of the injured survivors outdoors and unshielded in each distance zone incurred flash burns. Any form of protection decreased the percentages with burns.

A breakdown of the injuries into single and multiple types revealed that while two-thirds of the injured survivors had only 1 form of injury, this was not true of those within 3,280 feet of ground center, where 67 percent had multiple injuries. The types of injuries, alone and in combination, are presented in table 5. Here, by addition of the percentages, it is evident that 87 percent who were within the first

3,280 feet had radiation, but it was the sole injury for only 22 percent. The most frequent combination at this distance was radiation with mechanical injury—in 42 percent. Many such patients who received therapy were treated for their mechanical injuries only, since the effects of radiation were not immediately manifest. The influence of various kinds of protection or the lack of protection upon the types of injuries sustained is demonstrated in table 6.

Physicians of the Joint Army-Navy Commission assigned ratings of "severe" or "moderate" to the types of injuries described by the survivors whom they actually interviewed. Similar ratings were not made for the seriously injured persons who died in hospitals. The relative severity of the nonfatal injuries within the first 3,280 feet from ground center, which is of particular interest, is shown in table 7. Symptoms indicating severe radiation occurred in 57 percent of the 510 survivors not fatally injured in this zone, and in 66 percent of those who were outdoors and presumably shielded by walls or other objects. Severe radiation among such survivors in Japanese-type buildings was approximately the same as for those outdoors

and shielded, 64 and 66 percent, respectively. Thirty-eight percent of those in heavy buildings also had severe radiation injury.

Mechanical injuries which were considered severe occurred with approximately equal relative frequency in Japanese-type and in heavy buildings in this first zone.

Mechanical injuries were considered as the most severe type of injury sustained by 1,396 of the 2,826 persons who had this type of injury. As shown in table 8, the severe mechanical injuries in each distance zone increased with increasing protection and were incurred in approximately one-half to two-thirds of the injured persons who were indoors in buildings of either light or heavy construction.

Summary

Data pertaining to 6,343 survivors (5,136 injured and 1,207 uninjured) of the atomic explosion in Hiroshima on August 6, 1945, are analyzed with respect to the incidence of mechanical and radiation injuries and flash burns, in relation to distance from ground center and type of protection. The data were based on

Table 7. Percent of injured persons with moderate or severe nonfatal¹ injuries, 3,280 feet or less from ground center of explosion, Hiroshima

Type and severity of injury	Percent of total injured ² (510 persons)	Type of protection			
		Outdoors		Indoors	
		Unshielded (84 persons)	Shielded (47 persons)	Japanese-type building (276 persons)	Heavy building (103 persons)
Burns, flash.....	21	63	35	12	7
Moderate.....	17	49	31	10	7
Severe.....	4	14	4	2	
Burns, flame.....	.2			.4	
Moderate.....	.2			.4	
Severe.....					
Burns, not specified as to type or severity.....	7	18	11	5	2
Mechanical.....	69	29	53	80	82
Moderate.....	27	22	28	28	32
Severe.....	42	7	25	52	50
Radiation.....	85	86	89	89	68
Moderate.....	20	33	15	16	21
Severe.....	57	50	66	64	38
Questionable.....	8	3	8	9	9

¹ Excludes 296 persons who died in hospitals shortly after the explosion.

² Percentages in this table add to more than 100 since many persons had more than 1 type of injury.

Table 8. Persons with mechanical injuries, by location and type of protection¹

Location and type of protection	Mechanical injuries		
	Total	Severe	Percent severe
3,280 feet or less			
Outdoors:			
Unshielded.....	33	9	27
Shielded.....	30	17	46
Indoors:			
Japanese-type building.....	308	187	61
Heavy building.....	110	68	55
3,281-6,560 feet			
Outdoors:			
Unshielded.....	176	53	30
Shielded.....	168	69	41
Indoors:			
Japanese-type building.....	909	482	53
Heavy building.....	164	102	62
6,561-13,120 feet			
Outdoors:			
Unshielded.....	143	38	27
Shielded.....	73	29	40
Indoors:			
Japanese-type building.....	690	331	48
Heavy building.....	22	11	50

¹ This table omits the records of 85 autopsied persons since the severity of injury was not recorded by the physicians.

histories and interviews obtained by physicians of the Joint Army-Navy Commission which investigated the medical effects of the atomic bombs in Japan within a few months after the explosions. Pertinent observations are these:

All the exposed persons were within 13,120 feet from ground center of the explosion; 816 were within 3,280 feet; 2,844, from this distance through 6,560 feet; 2,122, from 6,561-9,840 feet; and 561, from 9,841 through 13,120 feet. These were survivors who were able to escape from the area of greatest damage either alone or with a minimum of assistance.

Forty-two percent of the exposed persons were reported as being out of doors at the time of the explosion, and 2,040, or 76 percent, of these were presumably not shielded and so were exposed to the full effects of the explosion.

The majority (3,249) of the 3,653 persons who were reportedly indoors were in buildings of light or Japanese-type construction, and 404 were in buildings of heavy construction.

The percentages of persons who were uninjured increased with increasing distance from ground center. Only 47 of the 1,207 uninjured persons interviewed stated that they were in heavy buildings at the time of the explosion.

Mechanical injuries (lacerations and contusions) were by far the most common type of injury, occurring in 58 percent of the injured, 82 percent of those who were indoors, and 28 percent of those outdoors.

Burns (flash burns in 2,311 and/or flash and flame burns in 11 instances) occurred in 45 percent of the injured survivors; in 17 percent of those indoors as compared to 80 percent outdoors.

Radiation injury, recorded for 34 percent of the injured survivors, occurred chiefly among those who were within 6,560 feet of ground center. The overall percentages of those indoors and outdoors with radiation effects were 39 and 27, respectively.

Although two-thirds of the injured survivors had only 1 type of injury, the same fraction of those within 3,280 feet of ground center had multiple injuries. Radiation was by far the most common injury in this first distance zone.

When the type of protection or lack of protection was considered, it appeared that mechanical injuries were noted more frequently among survivors in buildings than among those who were outdoors, and significantly more often in the relatively few survivors who had been in heavy buildings than among the large number who were in the Japanese-type structures. At a distance within 3,280 feet, 63 percent of the injured persons had mechanical injuries, in conjunction with radiation, burns, or a combination of both in 55 percent. Beyond this distance, the majority of those with mechanical injuries had no other type of injury.

Mechanical injuries classified as the most severe of the injuries sustained were noted more often for survivors in buildings and those outdoors who were shielded to some extent than for those who were entirely unprotected from the effects of the explosion.

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FDA Tolerances for Food Crop Pesticides

Procedural regulations issued by the Food and Drug Administration, Department of Health, Education, and Welfare, under the new pesticide amendment to the Federal Food, Drug, and Cosmetic Act went into effect March 6, 1955.

Under the new law, which becomes fully effective July 22, 1955, one year following its enactment, unless extended, food shipments bearing residues of pesticide chemicals in excess of established tolerances will be contraband and subject to seizure as adulterates.

Protection of the public under the law with a minimum of legislation is the aim of the Food and Drug Administration, hence, regulations establishing procedures for determining safe tolerances for pesticide chemicals were published in the *Federal Register*, February 4, 1955, pp. 770-771. However, petitions from chemical manufacturers have been processed according to the terms of tentative regulations published October 20, 1954, and the final regulations will not affect the petitions so processed. Any action taken in compliance with the tentative regulations will be regarded as complying with the law.

The final form of the procedural regulations differs from the tentative regulations principally in the following particulars:

1. A time limit of 15 days is established within which FDA must notify a petitioner of acceptance or nonacceptance of his petition.
2. Rewording makes it clear that a firm need submit a set of toxicity data to FDA only once.
3. An incomplete petition may be filed if the petitioner insists upon it.
4. A petition may be filed before a sample requested by FDA has been furnished.
5. Rewording provides a more definite time limit for consideration of a petition or request by an advisory committee.
6. The fee provisions of the regulation are changed to result in a more equitable assessment of the costs of the service. (The total cost of the service to the pesticide industry is now estimated to be slightly less than the original estimate.)

Regulations fixing tolerances for 28 pesticides that were in common use prior to the passage of the new law are still being reviewed by the Food and Drug Administration.

A Reappraisal of Tuberculosis in Florida

By CLARENCE M. SHARP, M.D., SIMON D. DOFF, M.D., EVERETT H. WILLIAMS, Jr., M.S.,
and ROBERT M. THORNER, M.B.A.

IN RECENT YEARS the tuberculosis mortality rate in Florida has diminished rapidly, declining from 17.9 per 100,000 population in 1951 to 16.9 in 1952 and to a low of 9.7 in 1953. The 1953 rate is substantially below the national rate of 12.5 as estimated from the 10-percent sample of death certificates filed with the National Office of Vital Statistics, Public Health Service (1). Only 303 deaths from tuberculosis among Florida residents were recorded during 1953, and for the first time in the history of death statistics in Florida, tuberculosis was not among the 10 leading causes of death.

It is unfortunate that mortality statistics provide the most frequently used measure of disease problems. They indicate poorly the trend of the incidence and prevalence of infectious chronic diseases such as tuberculosis because of the time lag between infection and death. Mortality statistics alone, as an indication of the magnitude and trend of the tuberculosis problem, are especially unsatisfactory, since improved therapeutic techniques have decreased the proportion of tuberculosis cases terminating in death. However, the rapid decline in mortality and the impending reduction in funds

available for tuberculosis control indicated a reappraisal of the tuberculosis problem and the present methods of X-ray case finding in Florida.

For this reappraisal, statistics collected from the 1953 X-ray screening in Florida were analyzed to develop an estimate of the prevalence of undetected cases in the general population.

An estimate of the number of undetected cases, when used with statistics on known cases derived from the tuberculosis case register, offers a much more satisfactory basis for planning a tuberculosis control program than does the use of mortality statistics alone. Estimates of prevalence made on an annual basis over a period of years will also indicate the trend of the tuberculosis problem more satisfactorily than will mortality figures.

These statistics of known cases and estimated undetected cases offer a good basis for the appropriation of tuberculosis control funds by State and local governments for use in planning hospital facilities and nursing services, for the operation of X-ray case-finding programs, and for the activities of the tuberculosis association.

During 1953, State and local health units in Florida made 70-mm. X-ray films of 382,304 persons. Of these films, 8,882 were interpreted as showing some type of pathology. A total of 4,448 were interpreted as indicative of tuberculosis (table 1).

Followup films were made on 2,762 patients showing signs of definite or suspected tuberculosis. A definite diagnosis of tuberculosis

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not previously known to the State board of health was established in 497 cases, yielding a new case rate of 130 per 100,000 persons screened on the original 70-mm. X-rays. Since the followup of the original screenings was only 62 percent complete, the actual rate is probably much higher. Hospitalization was recommended for 191 patients.

State X-ray Screening Survey

Included in the 70-mm. X-rays were 148,240 exposures made for "mass screenings," principally by mobile units of the State board of health. As more complete information concerning both the persons X-rayed and the results of followup was available for this group, a detailed analysis was made from these data. The age, race, and sex distribution of this group was compared to the general population and found to differ significantly. However, on the basis of available information, adjustments were made for these factors and statistical inferences were drawn regarding the prevalence of undetected tuberculosis in Florida. The methodology and results of this analysis are presented in this paper.

The 29 Florida counties surveyed (map) are not randomly distributed throughout the State, but are concentrated in western and south-

western Florida. Three universities located in counties not shaded on the map were also included in the survey. Since the survey was not intended primarily as a statistical study, no attempt was made to insure a random sample. The survey was made to find and bring to treatment cases of tuberculosis, and the statistics available represent a byproduct.

Counties were selected for screening on the basis of the time elapsed since a previous survey of that county. The mean elapsed time between the last survey of the counties in the study and the 1953 survey was 24.7 months, ranging from 11 months to 71 months. The length of elapsed time between surveys is undoubtedly a factor in the number of tuberculosis cases detected. A correlation between the time elapsed and the size of the new case rate in the counties surveyed showed a positive coefficient of $r=.41$. This correlation is significant statistically at the 5-percent level. Since the counties not included in the survey had been screened more recently than those included, some upward bias has been introduced into the prevalence estimate by this factor.

This bias has probably been more than offset by the fact that the counties surveyed are predominantly rural, and the counties containing Florida's largest cities are not in the area surveyed. Since tuberculosis case rates are generally higher in large cities, the geographic distribution of the counties included would tend to have a downward influence on the prevalence estimate (2).

Another factor exerting a downward bias upon the estimate of prevalence is the inherent assumption that nonrespondents to the survey would show a proportion of tuberculosis similar to that of the screened population. There is some indication that a higher proportion of the population which did not voluntarily respond to the survey would show signs of definite or suspected tuberculosis (3).

The methodology of the survey was typical of mass X-ray screenings of the general population. Advance publicity was given to the arrival of the survey unit. The X-ray team set up shop in a prominent location and photographed all persons 15 years of age or older volunteering.

These 70-mm. films were then read, chiefly

Table 1. Results of 70-mm. X-ray screenings and 14" x 17" followup films, Florida, 1953

Diagnosis	Number
Total 70-mm. films ¹	382, 304
Definite or suspected tuberculosis.....	4, 448
Cardiovascular pathology.....	1, 560
Tumor.....	170
Other pathology.....	2, 704
Negative.....	373, 422
Total 14" x 17" followup films ²	2, 762
New cases.....	497
Old cases.....	434
Suspected tuberculosis.....	206
Calcification.....	106
Other pathology.....	437
Diagnosis reserved.....	224
Negative.....	858

¹ Excludes unsatisfactory films.

² Followup of 70-mm. films with impressions of definite and suspected tuberculosis.

Shaded counties were included in tuberculosis survey and followups, excluding universities, Florida, 1953.



by the bureau of tuberculosis control of the Florida State Board of Health. When the impression indicated definite or suspected tuberculosis, an attempt was made to obtain a 14" x 17" followup film. Followup films were successfully obtained for 75.2 percent of the persons suspected of having tuberculosis.

As a result of these followup films, 187 new tuberculosis cases were definitely diagnosed, yielding an unadjusted case rate of 126.1 per 100,000 adults successfully X-rayed by the original 70-mm. films.

The Survey and General Populations

Since information regarding the age, race, and sex was collected at the time the survey X-rays were taken, it was felt that a good estimate of the number of undetected cases of tuberculosis could be made by use of these data.

A 10-percent sample of the 70-mm. X-rays diagnosed as negative was drawn for each county surveyed. Commencing with the fifth card in each county, every 10th card was selected. Cards were filed in the order in which the films had been taken. Information on race and sex, and on age was tabulated.

The race, sex, and age distributions of the 145,267 negative X-rays were estimated from this sample, and the distribution of the films with pathological findings was added to this to derive an estimate of the distribution of all of the 70-mm. films taken.

Since 1953 was fairly close to the census year of 1950, information concerning the race and sex distribution of the population of Florida in 1950 was used as a standard against which to

Table 2. Distribution of 1950 Florida adult population, 15 years of age and over, and of 1953 survey population by race, sex, and age

Race, sex, and age	Florida	Survey population	Percentage distribution ¹	
			Florida	Survey population
Total	2, 045, 502	148, 240	100. 0	100. 0
Race and sex:				
White male	795, 238	54, 820	38. 9	37. 2
White female	827, 465	59, 876	40. 4	40. 8
Nonwhite male	203, 713	16, 971	10. 0	11. 6
Nonwhite female	219, 086	15, 208	10. 7	10. 4
Unknown		1, 365		
Age:				
15-24	595, 027	46, 418	19. 3	32. 0
25-34	440, 625	28, 530	21. 5	19. 7
35-44	412, 153	27, 297	20. 2	18. 8
45-54	324, 207	20, 324	15. 9	14. 0
55-64	236, 016	13, 185	11. 5	9. 1
65 and over	237, 474	9, 408	11. 6	6. 4
Unknown		3, 078		

¹ Unknowns excluded.

judge the representativeness of the surveyed population. The adult population of Florida was distributed on a percentage basis by age, race, and sex, and these percentages were used as a theoretical set of frequencies for comparison with the survey group (table 2).

The persons of known age, race, and sex in the survey group were redistributed according to the theoretical frequencies, and a chi square test made. The survey group was found to fit the theoretical distributions poorly, chiefly as a result of the large number of university stu-

Table 3. Film impressions of 70-mm. mass X-ray screenings, by race, sex, and age, Florida, 1953

Race, sex, and age	Total films ¹	Percent of population ²	Film impression				
			Definite or suspected tuberculosis	Cardio-vascular	Tumor	Other pathology	Negative
Total.....	148, 240	28. 0	1, 344	597	66	966	145, 267
Race and sex:							
White male.....	54, 820	27. 0	623	141	23	456	53, 577
White female.....	59, 876	29. 4	427	170	23	313	58, 943
Nonwhite male.....	16, 971	32. 0	187	138	13	114	16, 519
Nonwhite female.....	15, 208	26. 6	96	139	5	74	14, 894
Unknown.....	1, 365	-----	11	9	2	9	1, 334
Age:							
15-24.....	46, 418	39. 6	157	51	1	103	46, 106
25-34.....	28, 530	26. 3	130	28	6	83	28, 283
35-44.....	27, 297	27. 5	193	49	5	161	26, 889
45-54.....	20, 324	26. 6	263	112	16	175	19, 758
55-64.....	13, 185	23. 3	251	104	18	185	12, 627
65 and over.....	9, 408	15. 9	314	245	19	235	8, 595
Unknown.....	3, 078	-----	36	8	1	24	3, 009

¹ Excludes unsatisfactory films.

² Based on 1953 estimated corresponding population group in counties surveyed.

Table 4. Findings on followup by 14" x 17" X-ray of definite or suspected tuberculosis, mass X-ray screenings, Florida, 1953

Race, sex, and age	Follow-up films	Percent follow-up	Findings					
			New cases	Old cases	Suspected tuberculosis	Calcification	Other pathology	Diagnosis reserved
Total.....	1, 011	75. 2	187	142	82	19	191	79
Race and sex:								
White male.....	478	76. 7	80	83	35	8	104	50
White female.....	333	78. 0	60	44	26	9	60	22
Nonwhite male.....	132	70. 6	35	10	12	1	14	6
Nonwhite female.....	63	65. 3	11	4	8	1	13	1
Unknown.....	5	-----	1	1	1	-----	-----	-----
Age:								
15-24.....	119	75. 8	12	5	8	1	19	2
25-34.....	102	78. 5	23	22	3	1	8	10
35-44.....	141	73. 1	37	26	9	1	26	6
45-54.....	200	76. 0	45	27	24	5	31	15
55-64.....	194	77. 3	33	26	22	7	36	22
65 and over.....	238	75. 8	34	33	16	4	70	24
Unknown.....	17	-----	3	3	-----	-----	1	-----

dents included, and was judged not to be representative of the total Florida population.

To compensate for the poor correspondence of the survey population to the general population, age-specific rates were computed and used to derive an estimate of the number of undetected cases in Florida.

Rates were developed for specific population groups based on a cross tabulation by age, race, and sex of the 187 new cases, and the corresponding number of persons in each age, race, and sex group of the surveyed population. The estimated adult population of Florida as of July 1, 1953, was prorated according to the age, race, and sex distribution of the 1950 census. The age-specific rates were then applied to each population group to derive an estimate of undetected cases in 1953.

This procedure introduces many possibilities for error. The number of cases in each age bracket is small, and the rates correspondingly irregular. The age distribution of the population has undoubtedly changed since 1950, and the projected population also must vary from the actual to some degree. However, it is believed that the method is reasonably accurate and is considerably better than an estimate based on the unadjusted case rate.

One additional adjustment was believed necessary to derive a prevalence of undetected cases in 1953: an adjustment for incomplete followup of the definite and suspected cases detected on the 70-mm. films.

The film impression results, percent followup by race, sex, and age, and new cases found appear in tables 3-5. No significant difference in percent followed (at the 5-percent level) could be found for the two most divergent age groups, or by race (table 4). It was therefore decided that the overall followup percentage (75.2) could be used as an adjusting factor if it were assumed that a similar proportion of the cases lost to followup would have been definite tuberculosis cases. The adjusted figure for undetected cases in 1953 is 4,856, and the rate 211.1 per 100,000 adult population.

To this figure may be added the 11,608 known cases of active, questionably active, and inactive pulmonary tuberculosis under supervision by local health departments in 1953, yielding a prevalence estimate of 16,464 known and undetected cases.

In contrast to the small number of deaths, 303, these figures indicate that tuberculosis remains a major health problem in Florida.

Table 5. Activity and stage of new cases found, by race, sex, and age, mass X-ray screenings, Florida, 1953

Race, sex, and age	Total	Stage				Activity			New case rate ¹
		Minimal	Moderately advanced	Far advanced	Unknown	Active	Inactive	Undetermined	
Total	187	76	87	12	12	49	59	79	126.1
Race and sex:									
White male	80	38	32	5	5	22	27	31	145.9
White female	60	25	27	1	7	10	27	23	100.2
Nonwhite male	35	7	22	6		14	2	19	206.2
Nonwhite female	11	5	6			3	2	6	72.3
Unknown	1	1					1		
Age:									
15-24	12	3	8		1	8	2	2	25.9
25-34	23	5	14	3	1	12	5	6	80.6
35-44	37	16	14	4	3	11	6	20	135.5
45-54	45	17	24	2	2	10	14	21	221.4
55-64	33	13	15	1	4	4	17	12	250.3
65 and over	34	20	12	1	1	2	14	18	361.4
Unknown	3	2		1		2	1		

¹ Rate per 100,000 satisfactory 70-mm. films.

Administrative Uses

Administratively, several important facts became apparent as a result of the detailed analysis. While the case rate increased considerably with age (table 5), the proportion of the population surveyed became progressively smaller with age (table 3). Case rates were higher for males than for females (table 5), but a relatively constant proportion of each sex group was surveyed. Evidently, case-finding efforts will yield greater returns if a greater proportion of older persons and males can be screened.

The largest proportion of cases found (87.2 percent) were in the minimal or moderately advanced stages, indicating that the mass screening technique is successful in finding cases at a stage when treatment of active cases or supervision of questionably active cases can be most successfully undertaken.

The distribution of new cases by activity is based chiefly on the reading of the 14" x 17" followup films and only in part on clinical study. The proportion of active cases decreased progressively with age, and the proportion of cases with activity undetermined tended to increase. This has probably resulted from the difficulty of making a diagnosis from 14" x 17" chest X-ray films in older persons who are more likely to have calcification, fibrosis, and caseation, whereas the younger patients are more apt to have exudative lesions and present less difficulty in determining activity.

Future Plans

The productivity of X-ray screening will, of course, diminish as the prevalence of tuberculosis is reduced, and the cost per case found will increase correspondingly. It is difficult to assess at what point the yield of the X-ray technique does not justify the expenditure.

In Florida, the 1953 X-ray screenings yielded 497 new cases. There are no figures available showing how many additional cases resulted from the followup of contacts of these infected persons, but this number is believed to be substantial. It would seem that this method of case finding is still sufficiently productive in Florida to warrant its continuance.

As the prevalence of tuberculosis is further reduced, the X-ray screening program will be directed toward those areas and age, race, and sex groups which will yield the greatest number of cases as indicated by the present general surveys.

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The State of the Nation's

public
health
services

Excerpted reports from the 53d Annual Conference of the Surgeon General of the Public Health Service and the Chief of the Children's Bureau with the Association of State and Territorial Health Officers and with State Hospital and Mental Health Authorities, December 6-10, 1954, Washington, D. C.

Health Action Programs To Meet The Needs of Today

1 By Oveta Culp Hobby
Secretary of
Health, Education, and Welfare

These annual meetings give us in the Department of Health, Education, and Welfare an opportunity to find the ways in which the local, State, and Federal governments can best work together for the better health of the American people.

During the coming year we in the Department are going to place primary emphasis on health and on the means through which we may move toward its improvement throughout the Nation.

In today's world the prospect of better health and of longer, happier lives for the American people now is not a distant dream. This Administration has set itself the task of narrowing the gap between what is possible and what is actual.

President Eisenhower has left no doubt regarding the vigor with which a health program will be pushed. As the President said in his speech at the Alfred E. Smith Foundation in October:

"The start now made is only a first beginning on a vast human enterprise—the health of our Nation. This is a task for the individual citi-

zen, the city, the county, the State, and finally, the Federal Government. We Americans have accomplished near miracles in material things. But we are years behind our potential achievement in the availability and adequacy of health services. That deficiency we shall correct.

"But I repeat, the task does not belong exclusively or even primarily to the Congress and the Government. It belongs to each of us and to the communities in which we live. The inadequacy will be fully remedied only as each of us performs his full duty as an American citizen, certain that in so doing he is not only relieving distress but making a more durable contribution to the Republic."

Sound legislation is one of the requisites for action. The last Congress, as you are aware, enacted two important measures directed toward today's health problems. These broadened and extended the Hospital Survey and Construction Program and substantially expanded the Federal-State program to rehabilitate the handicapped.

As a result, you—and your colleagues in communities throughout the Nation—are already, or will shortly, have a part in planning the construction of badly needed chronic disease hospitals, nursing homes, rehabilitation centers, and diagnostic and treatment clinics. More disabled people will be returned to active, useful lives. There will be more facilities and more services for the care of older people and those chronically ill.

These are forward steps. They are in keeping with our efforts to see that health programs and activities are designed to meet today's needs rather than yesterday's crisis or tomorrow's imponderables.

One of our important objectives has been to encourage the growth and improvement of voluntary health insurance so that more people can be protected against the costs of illness. To this end the President has proposed a system of voluntary health reinsurance.

In Exploratory Stages

Many of the health problems which need planning and action are as yet in the exploratory or preliminary stages. I would like, however, to mention some of the problems.

Many of you here have a deep interest, for example, in the problems of air pollution and of water pollution. Some States have already undertaken, in cooperation with local communities, remedial efforts. The President has expressed his deep concern about air and water pollution problems. Certainly there is a great need for expanded activity here, particularly in the way of research and field investigations.

Juvenile Delinquency

Another grave national problem is juvenile delinquency. The Department has been studying methods by which the Federal Government can assist States and local communities in meeting this serious social problem, with its important health implications.

New concepts are emerging which point to ways health departments can help prevent delinquency. Mental health principles are being increasingly employed in health and treatment centers serving parents and children. Certainly those of you who are administering mental health programs have a great deal to contribute in the battle against delinquency.

To combat juvenile delinquency, the Congress made a supplemental appropriation of \$75,000 to the Children's Bureau. This appropriation will enable the Bureau to aid States, local communities, and other groups to plan, coordinate and improve the services they provide for delinquent children.

The Field of Civil Defense

This Department has recently received by delegation from the Federal Civil Defense Administration some very serious responsibilities in the field of civil defense. In approving this delegation, the President has again indicated the importance with which he regards this program in planning for national welfare and security.

Many of you have already done considerable work in planning for casualties in the event of local disaster. We must give increasing attention to the problem of maintaining living conditions as close to normal as possible in the face of the confusion and dislocation which would follow such a disaster. As a result of the recent

delegation of authority, the Department can now work with you in developing a coordinated national approach.

In connection with this activity, I should like to make special note of the Public Health Service's plans for substantial expansion of the Commissioned Reserve. The principal reason for this, of course, is to provide a corps of trained public health workers for service in national emergencies. Its immediate goal is the commissioning of an additional 2,000 reserve officers by June 30, 1955.

Another recent significant event has been the congressional transfer of the health and hospital services for the Indian people from the Bureau of Indian Affairs to the Public Health Service.

State-Federal Relations

The Department is going to need your help in the solution of this complex problem. Effective use of our existing local-State-Federal machinery for preventive services and disease control will give us our best chance for success.

It is through the established pattern of combined local, State, and Federal action on health problems that we can reach our mutual goals of a stronger and healthier America. The philosophy of Federal-State relations held by this Administration, and by the Department, coincides closely with your own. Some of our basic beliefs parallel those embodied in the proceedings of these conferences over the years.

Let me conclude by restating a few. We believe:

That the States and the Federal Government are interdependent in the fight against disease and disability.

That the Nation as a whole must share responsibility for those State and local public health services of national or interstate significance.

That when more effective methods of combating health problems are developed, assistance should be made available for their nationwide application.

That all this should be done with a maximum of State and local initiative, decisions, and State responsibility—and with a minimum of Federal control.

On these principles, the work of the Department has gone forward. With this philosophy, I am convinced, we can continue to meet today's health needs, and tomorrow's.

Breaking the Trail For New Public Health Advances

2 By Leonard A. Scheele, M.D.
Surgeon General of the
Public Health Service

In this meeting, you and I are carrying out a statutory responsibility first placed upon the Nation's Federal and State health agencies more than half a century ago. The State and Territorial health officers, together with the State hospital and mental health authorities, comprise the largest group of official advisers to the Public Health Service.

As your chairman, I wish to place before you a few of the important events that have occurred in the Public Health Service since we last met. This I propose to do first, and then to discuss with you the orientation of public health to deal more effectively with the major health problems of today.

Facilities Construction and Rehabilitation

I need not elaborate on the provisions of the Medical Facilities Survey and Construction Act of 1954. The Public Health Service has been meeting with State and Territorial hospital authorities and with representatives of the many other groups involved in the program. The Federal Hospital Advisory Council has met twice to discuss and pass upon regulations, to be issued officially on or before January 1, 1955. A supplemental appropriation, providing \$2 million for State surveys and \$21 million for construction grants, has been passed.

With publication of the regulations, the way will be clear for the States to complete their surveys and develop their plans for construction in the neglected fields of chronic disease facilities, diagnostic treatment facilities, nursing homes, and rehabilitation facilities. We look forward to the development of a program as successful in improving the Nation's health as the original Hill-Burton program. We all have a fine opportunity to help fill important gaps in the Nation's physical resources for health, specifically in resources for care of the long-term patient.

Vocational Rehabilitation

The expanded rehabilitation program administered by the Office of Vocational Rehabilitation offers another opportunity for progress. I had the privilege recently of addressing the National Rehabilitation Association at its annual meeting. The association is one of the major voluntary agencies in its field and counts in its membership State and Territorial directors of vocational rehabilitation and services to the blind. It seemed to me significant and prophetic of future cooperation that they should invite a health officer to deliver their keynote address.

I urged your counterparts in the field of rehabilitation to seek the cooperation of their official health agencies. So I urge you to increase your cooperation with State directors of rehabilitation and services to the blind. As staunch allies, our State health and rehabilitation agencies have it in their power to bring about real advances in care of the handicapped and in control of chronic diseases and care of the aged.

Indian Health Services

The transfer of hospital and health facilities for American Indians to the Public Health Service was accomplished with the approval on August 5, 1954, of Public Law 568, 83d Congress.

Besides the obligation to develop and operate an adequate hospital and medical care program for the Indians, the Service is challenged to apply the public health methods which we know

can greatly reduce Indian mortality and morbidity owing to preventable diseases. We expect to encounter problems like those with which our health missions are dealing in foreign countries. Indian health problems are often the problems of people who retain their primitive cultures and who have never known high standards of living or high quality health services.

Just as the Public Health Service and the States have worked together in helping to solve similar problems overseas, we will also be calling on you for advice and active support in the Indian health program. This includes your active help in recruiting personnel. We hope that State and local agencies will be able increasingly to provide a larger share of direct health services to Indians. We plan to increase emphasis on preventive services, on early case finding and treatment, and on improved medical care in the ambulatory clinics and hospitals.

Water Resources and Pollution

The Nation's problem of water resources is receiving intensive study at the highest policy levels of Government. The Public Health Service is participating actively in the work of the President's Cabinet Committee on Water Resources Policy as well as in the work of the new Interagency Committee on Water Resources.

Water pollution control is a vital factor in water resources development. Water shortages can sometimes be met through construction of dams to store water for use as needed. The solution, however, must be found in the preservation of water quality through pollution control. This permits repeated use of water as streams flow from city to city and from industry to industry.

It is always easier to get public and official support for the development of new sources of water supply and for water treatment facilities than for treatment of sewage and wastes. No one wants to worry about unglamorous waste treatment so long as sewers carry away the wastes.

"Out of sight, out of mind" is a dangerous attitude toward sewage and wastes. I hope that you will use your influence to disabuse the public and State and local government officials of this attitude. They must be made aware of the

critical need for waste treatment works. Water works have advantages today which are not provided sewage treatment works. A real need is to develop better methods for financing sewage treatment as an integral part of the community's total water service.

In Civil Defense

The Federal Civil Defense Administration has delegated specific authorities to the Department of Health, Education, and Welfare. Those for which the Public Health Service is responsible include: (a) research, primarily in the fields of biological and chemical defense; (b) development of a national program of technical guidance to the States and direction of Federal activities for the emergency restoration of community public health services; and (c) provision of Reserve Corps officers for emergency service in heavily damaged areas.

The National Institutes of Health, the Communicable Disease Center, and the Robert A. Taft Sanitary Engineering Center are working on projects in cooperation with the Armed Forces, the Atomic Energy Commission, and the FCDA. The Office of Health Emergency Planning in the Office of the Surgeon General remains the coordinating unit in the Public Health Service and is our primary liaison with these key agencies.

An expanded defense training program for key personnel of the Public Health Service is now under way. A main purpose is to develop new materials and instructional activities for State and local health personnel. The Service will be concerned not only with technical problems but also with administrative methods for utilizing all public health resources in an emergency.

Commissioned Reserve Corps

Perhaps the most challenging of our new defense responsibilities is the development of a more adequate Commissioned Reserve Corps in the Service. World War II proved that to be effective a Commissioned Reserve should be recruited in peacetime and adequately trained for duty in emergencies. The plan is to take those steps now and thus avert conditions which

were unsatisfactory to all concerned during the last war.

Our aim is to augment—not to deplete—the available supply of personnel for duty in public health activities and to assure their mobility. In developing the Commissioned Reserve we will work out with you plans for the most effective training and utilization of existing health personnel. At the same time we will recruit actively outside State and local public health staffs.

We will use every available resource to train reserve officers in the health problems associated with atomic, biological, and chemical warfare, and other emergency health problems. We do not expect to call officers in the emergency reserve to active duty without their consent, except in the face of a clear and present danger, publicly recognized.

It is to the self interest of every health officer and his staff to promote the development of the Commissioned Reserve.

The Goals of Public Health

The fundamental goals of public health have not changed with the changing years and the changing world. Our professional forefathers set those goals in broad terms that are as relevant to our times as to theirs.

Shattuck in 1850 wrote:

"The conditions of perfect health, either public or personal, are seldom or never attained, though attainable . . . The average length of human life may be very much extended and its physical power greatly augmented . . . A vast amount of unnecessarily impaired health and physical debility exists among those not actually confined by sickness . . . These preventable evils require an enormous expenditure and loss of money and impose upon the people unnumbered and immeasurable calamities, pecuniary, social, physical, mental, and moral, which might be avoided . . . Means exist, within our reach, for their mitigation or removal . . . Measures for prevention will effect infinitely more than remedies for the cure of disease."

Please note that no particular groups of diseases, no special population group is singled out as the proper objective of public health action. There is no narrow definition of the means

by which the goals of personal and public health shall be attained, save an affirmation of the universal truth that prevention is more effective than cure. The goal is not merely to extend life but to augment its power. The full physical, mental, economic, and social impact of ill health is recognized as the proper target of public health action; and prevention includes "mitigation or removal."

These are the problems and goals of public health today. The fact that the major causes of death and ill health have changed does not remit one single clause in the public health charter of responsibility.

There is a tendency to restrict these problems and goals to a narrow vision of conquering specific disease entities by specific techniques. We are challenged, therefore, to throw off our blinders and see. As the specific problems have changed, so our approaches to, and methods for, their solution must change also. Even the traditional fields, sanitation and communicable disease control, demand new approaches and methods.

Air Pollution

I would like to give you one illustration of the lag in attacking new problems in these old fields.

Air pollution is a chronic, massive problem for virtually every large city in the country. In the past 6 years, the public concern about air pollution has reached fever pitch in some urban areas.

There has been a notable lack of interest and action in State and municipal health agencies and in some of the Federal services. When we mention Pittsburgh, St. Louis, New York City, and Los Angeles, we have just about called the roll of metropolitan areas which have had any major control effort leveled at their problems of air pollution.

No one has yet developed fully effective control measures for all types of air pollution, especially for the invisible fumes and gases discharged into the general atmosphere.

We do not have epidemiological data to compare a generation's experience in exposed and control populations. But there is a body of information—engineering, chemical, meteorological, and medical—which confirms the public

concern and which would provide a beginning measure of control, if applied. However, there is a basic need for intensified research by all groups concerned: industry, private laboratories, communities, States, and Federal agencies.

We also need intensive scientific study of many other unsolved problems in environmental health and in communicable disease control. Such studies absorb a significant proportion of the Nation's total medical and public health research expenditure; and they will eventually yield results that may radically change our approaches and methods in these traditional fields. But real improvements can be made now, by applying what is known today. We cannot deal with the chemical and viral threats to health by a "swivel-chair" approach, nor by chief reliance on methods learned even 20 years ago.

There must be a critical appraisal of our methods in all fields and a shift of our public health efforts away from the obsolete activities. Even more important, we must orient our young professional staffs in the new problems public health faces. If we do not make these changes, I fear that public health departments will not play the significant role which should be theirs in helping the Nation to lift the physical, mental, social, and financial burden of long-term illness. New State and local agencies will continue to be created, outside established health departments, to deal with this transcending health problem. The fragmentation of health services will continue, while many health departments, with fine records of past accomplishment, will be left at the starting post.

Long-Term Illness

Long-term illness cannot be defined nor successfully attacked in terms of specific disease entities and their specific control. The roots of long-term illness are in a vast multiplicity of causes, some of which are known, and many of which are unknown. Long-term illness reaches into every segment of individual and community life.

Last spring the Commission on Chronic Illness called a conference on care of the long-term patient. The title of the conference was

no idle choice; it places the focus where all future effort in the control of chronic diseases must be placed—on the patient. I commend the recommendations and proceedings of that conference to your earnest study.

We cannot fail to be impressed by the growing body of medical knowledge and professional skills ready for application to the problems of the long-term patient, as well as with the increasing number of community experiments with new types of service for the chronically ill and the handicapped. However, our public health methods for tapping these resources and applying the new skills are, on the whole, deficient.

This leads me to suggest a refocusing of public health attention—on the individual patient. If we are to maintain our front-rank position in the maintenance of the Nation's health, we must work more effectively with medical practitioners and with a wider range of voluntary and official agencies concerned with prolonged illness. All of us must become better specialists in dealing with people, and more expert in the organization of resources for the care of the long-term patient.

Coordination of Services

Our experience in attempts to control specific diseases by means of specific techniques has clearly revealed many organization problems. It has shown us that the major barrier to good results is the lack of coordination of public health, medical, and related services in the community. We need much more research and more pilot projects in this vital area. Meantime, there are encouraging signs of a growing interest among health departments in better organization of their own resources.

Several State and large city health departments are engaged in studies or practical application of methods related to the coordination of services.

The Public Health Service has recently reorganized its Bureau of State Services and has established an Interbureau Chronic Disease Study Committee. Both actions have the purpose of integrating our operations along functional lines, and of affording better coordination with related activities in the Department

of Health, Education, and Welfare, the States, and voluntary agencies.

The New York City Health Department has recently undertaken a significant study in cooperation with the Service. The first phase of the study is to determine the extent of referral and coordination between municipal health services and the services provided by industries, organized groups such as unions, and voluntary agencies. We are confident that the findings will give clues to better methods for coordinating community health services, but we need a great deal more experience than our current efforts can provide.

Although the Nation has not gone as far as it will go in the coordination of medical and hospital services, the past 10 years have seen rapid progress in this direction. The teaching hospital and the medical center are being turned to increasingly as sources for consultation and continuing education programs for the medical and related professions in the major health problems of the day.

Personnel Problems

We have made too little progress in the recruitment of public health personnel, especially of physicians. What are the barriers? Public Health Service studies of the engineering profession indicate that low economic reward is not the sole, nor even the determining, barrier to entering sanitary engineering. Recruitment practices proved to be poorly timed, and the information supplied to engineering students proved inadequate.

Can we do something about comparable problems in medical schools, and even in their seedbeds—the colleges and high schools? The pre-medical and medical curriculums could be enriched to show the students that public health and administrative medicine have attractions comparable with those of the clinical specialties. State health officers are in excellent position to influence educational authorities in their States in this direction.

Need for Special Training

The Nation's medical schools are turning out a superior product in all departments. The new

medical graduate has a far better concept of the role of the general practitioner, and of the significance of psychiatry and preventive medicine than his counterpart of 15 or 20 years ago. The teaching of cancer and of cardiovascular and mental diseases also has been expanded during the past 5 or 6 years. Very few medical students in the future will reach their internships without up-to-date instruction in these important fields. In more medical schools than ever before, modern concepts of preventive medicine and environmental health are being taught as important elements of the undergraduate curriculum.

Nevertheless, the supply of physicians available for public health and medical administrative work is meager, and the majority of graduates in all the health professions still require specialized training to do a competent job in our health departments. The cutbacks in recent years in the training programs of State health departments are therefore most disturbing. Our State and local officials and legislative bodies must be made aware of the needs for special training of men and women after employment in public health.

Professional public health workers of today must be more than craftsmen skilled in the performance of specific techniques. They must be creative thinkers—problem solvers in a much larger universe of problems than they have hitherto accepted as their responsibility. They must be masters of a body of knowledge in relationships and resources, upon which they can base sound proposals for dealing with each new situation involving the health of a community and its individual citizens.

I leave you with the same challenge that has faced us each of the past 6 years I have spoken to you from this platform. It is a challenge of adjustment and adaptation to changing needs, a challenge that cannot be fully met over a lifetime.

We are beginning to see in clearer outline the total problem of prolonged disability. Means for its prevention and reduction are increasing in number and effectiveness. Our next steps should be toward a better orientation of our thought, our personnel, and our services for the application of the new knowledge—present and

to come. We must not be complacent because of our low total death rate. We must remember that with the prolongation of many more lives into older age brackets many more people are suffering the chronic and crippling illnesses of older age. These are our challenge.

Child Health Problems: Juvenile Delinquency; Black Market in Babies

3

By **Martha M. Eliot, M.D., Sc.D.**
Chief of the
Children's Bureau

The major development of 1954 in the Children's Bureau is the creation of a new division to deal with the problems of juvenile delinquency.

The Division of Juvenile Delinquency Services will provide technical aid to States and local communities. The new division will work closely with the Bureau's Division of Health Services and expects to prepare material on the role of health departments in the prevention and treatment of juvenile delinquency.

The high point in the Bureau's efforts to deal with the problems of juvenile delinquency was a national conference, June 28-30, attended by police officers, juvenile probation officers, welfare and health workers, educators, churchmen, and others who are professionally engaged in programs on behalf of youth.

During the year a number of publications relating to juvenile delinquency were completed. One of these, "Standards for Specialized Courts Dealing With Children," was prepared in cooperation with the National Probation and Parole Association and the National Council of Juvenile Court Judges.

Other publications included "Police Services for Juveniles" and "Tentative Standards for Training Schools." Still other publications tell citizens about the nature of the problems of juvenile delinquency. Statistical and research studies have also been made.

Black Market in Babies

Another problem of great concern is the so-called black market in babies. By this, we mean the sale of babies for profit to would-be adoptive parents. Health departments can be of major assistance in helping meet this problem.

Most of the babies involved are born to young unmarried women. Approximately 146,500 babies are born to unmarried mothers each year. Almost one-fourth of these mothers are only 17 years or younger. The black market operators take advantage of these girls at a time of deep emotional stress.

In some cities the practice of agreeing to give up the baby in advance of birth in order to have the medical bills paid has resulted in a black market that is very lucrative to the operators.

The Bureau has employed a specialist to develop plans for enlisting the cooperation of legal, medical, social work, and law enforcement groups in an effort to improve and extend social services and medical and hospital care for unmarried mothers and to eliminate or reduce unprotected placement of children in adoptive homes.

We must also concern ourselves with babies placed in families not related to the baby by persons who have every desire to help but who cannot provide the legal or social protections every adoption should have. Even though no money is exchanged, this type of unprotected placement may be just as bad for the child as one taking place in the black market.

Efforts directed in some of the following ways would of themselves result in the prevention of many unprotected placements:

State health departments can cooperate with welfare departments on the health aspects of the problem and can work with medical societies toward a better appreciation of the importance of good adoption practices.

The local health officer is often in a favorable position to bring together the several public and private agencies that are involved.

Prenatal clinics have much to offer to the care of the pregnant girls.

Public health nurses through their close knowledge of the communities in which they work are in a strategic position to assist girls in getting to social agencies and in working out arrangements for medical and hospital care during confinement.

Mental Retardation

During the past few years a large number of parents of mentally retarded children have organized the National Association for Retarded Children and are doing a great deal to focus public interest on the needs of these children. This group, numbering about 30,000 parents, includes many who are forthright in letting it be known that they have mentally retarded children.

Although we are reexamining an old problem, we are learning that mental retardation is not in itself a single entity but includes a wide range of intellectual ability below an I. Q. of 70 or 80. Most of these children are believed to have a mental capacity that makes at least partial self-support possible to attain.

The Bureau is particularly interested in what can be done to help these children during infancy and the preschool years. This is the period when parents have doubts regarding their child's development and take him to their physician or to a child health clinic for diagnosis.

Far too often the advice is to place the child in an institution even though institutions are so crowded that there is a long waiting period and many will not accept a child until he is 6. A large proportion of these children will develop much better at home. The preschool years are a significant period for the child's development during which the parents need much help.

A program for mentally retarded children should include a special diagnostic center in connection with a pediatric program where the diagnosis can be made and where a plan can be developed for each child at an early age. On

this basis, referrals for institutional care can be made on a much more selective basis than at present.

Most parents would be much better able to care for these children at home, at least in early childhood, if such care were a part of a plan that includes followup visits to the special clinic for supervision, nursery school classes, special classes at regular schools, and social services. Such a program calls for a close working relationship on the part of the health, education, and welfare departments, and the parents of the children.

The Bureau has recently granted funds for a pilot project at the Children's Hospital in Los Angeles. We hope to employ a specialist to study how community services for mentally retarded children can be further developed. The Bureau, the Office of Education, and the National Institute of Mental Health of the Public Health Service will work to press for improvement in many aspects of this community program.

Children of Migrants

Ten States in the east coast migrant stream met here in May 1954 for a conference sponsored by the Public Health Service, the Children's Bureau, the Office of Education, and the Bureau of Public Assistance. The States planned the agenda and during the conference developed concrete plans for action. Public and private groups within the States actively engaged in working with migrants were included.

Since the conference a number of things have happened. United efforts by a number of agencies resulted in a day care center in one Pennsylvania county. Using a special project grant from the Bureau, the Florida State Health Department has employed a coordinator of migrant activities to work in the counties with large migrant populations and to follow the families up the coast to see what they get or do not get in the way of services.

The Department is acting as a clearinghouse for information progress in the 10 States represented at the conference and is soliciting information from each to pass on to the others in the migrant stream.

Nearly 8,000 of the school transfer record

developed during the conference have been requested by the States. This is a small card which the child carries from school to school; it contains brief data on his grade placement and his health record.

The conference referred to your committee on migrants the recommendation that a similar record be developed for health. Another recommendation called for the health officer in each of the 10 States to name a representative to a task force to develop minimum standards for housing and sanitation for transient laborers.

Maternal and Child Health

The gains of the past few years in maternal and child health have been maintained. Definite progress is being made in the prevention of retrolental fibroplasia, an unknown disease a few years ago but now the leading cause of blindness in children.

With the increasing skills we have acquired in saving the lives of premature infants, especially those weighing less than 1,500 grams, the emergence of retrolental fibroplasia as a disease of small premature infants is one of the major obstacles in their care. Some physicians, parents, and others have had misgivings about life-saving efforts which have resulted in a sharp increase in blindness among babies.

There is now strong evidence that excessive oxygen administration is the major cause of retrolental fibroplasia. This evidence comes from clinical observations and laboratory studies, from independent observations, and most recently from a national study.

Study on Retrolental Fibroplasia

A preliminary report (September 1954) of the National Cooperative Study on Retrolental Fibroplasia represents the first 6 months' experience of 75 pediatricians and ophthalmologists in 18 hospitals over the country. Premature infants who weighed 2,500 grams, or less, at birth and who survived 48 hours were assigned to 1 of 2 groups. One group of 68 infants was given oxygen in routine amounts; the other group of 144 infants received curtailed amounts.

The study was set up to test not only the association between the use of oxygen and the incidence of retrolental fibroplasia but the mortality risk involved in the use of curtailed amounts of oxygen.

The preliminary results show no significant difference in the mortality of the two groups of infants receiving different amounts of oxygen. There was, however, a significantly lower incidence of retrolental fibroplasia in the infants whose oxygen was curtailed.

The conclusion drawn from this and other studies is that the use of oxygen should be restricted to amounts which are required for the survival of the infant. Although oxygen requirements of individual infants vary, present recommendations seem to be that no infant be placed in a concentration of oxygen over 40 percent.

This good news gives us every encouragement to increase our programs for prematurely born infants and our efforts to reduce the incidence of premature births and of fetal deaths.

Studies by the Chicago Board of Health emphasize the importance of the first day of life in the survival of infants. More attention to this period, a critical one for many babies, will result in greater reductions in neonatal mortality. This requires application of existing knowledge regarding the causes of death of premature infants as proved by autopsy, better prenatal care, and improved management in pregnancy and labor of mothers who have complications of pregnancy.

Crippled Children's Services

Each of you has a major role in the State crippled children's programs, if not through administration, then through the case-finding, preventive, and followup services in your local health administration and in your maternal and child health programs.

The experiences gained through the crippled children's programs since 1936 provide an invaluable laboratory for the study of medical care administration and of long-term illness. Here are most of the ingredients of prevention and medical and social rehabilitation. Here is a program that has the strong support of public

and voluntary agencies, of private practitioners, of parents, and of the general public.

As we see how the interest in the crippled child increases and how much there is to be done, the methods we use to extend and improve these programs become increasingly important.

I am impressed by the wide varieties among the States in the proportions of the different diagnoses. In one State 38 percent of crippled children receiving physicians' services in 1 year had a diagnosis of hearing impairment. In other States which include this condition, the proportion is as low as 1 percent. The percentage of children under care because of congenital malformations varies from 44 to 6 percent. Yet, there is no reason to believe that the incidence of congenital malformations differs much from State to State.

To a very considerable degree, the crippled children's agencies are dependent on the maternal and child health programs for finding and referring the children with congenital malformations. The largest proportion of children in the programs are those who have congenital malformations of varying types, comprising 21 percent of all the children receiving physicians' services.

Most of these are recognizable early, and, therefore, your public health nurses and child health conferences are a major source of case finding and early referrals. I need hardly tell you how important early case finding is in the provision of medical care and the prevention of disability or its progression.

School health services are another major source of case finding. We have an efficient and rapid means for case finding through audiometry although most States have as yet not been able to include children with hearing impairment in their programs.

For the first few years of the crippled children's programs, virtually all the children receiving care had orthopedic diagnoses. Then, children with rheumatic fever were included, first in one State and then in another until gradually 28 States developed rheumatic fever programs.

Similarly, children with cerebral palsy, epilepsy, congenital heart diseases, hearing impairment, and other conditions have been included in many States. This has come about largely

through the demonstration technique which public health has employed so successfully.

Artificial Hands for Children

The Bureau has been working with the Army Prosthetic Research Laboratory of the Walter Reed Army Medical Center to see if a lifelike, functional hand comparable to the new artificial hands available for adults could be developed for children.

The first step was to contract for the production of the dies for the hand in 3 sizes: 6 years, 9 years, and adolescence. In view of the expense involved and the many problems to be explored in the use of children's hands, no single group or company could undertake the venture.

Accordingly, last spring the Michigan Crippled Children Commission with a grant of special funds from the Bureau contracted with a prosthesis company for the manufacture of dies for children's hands. An additional grant will make possible the production and delivery of functioning hands during the next fiscal year. Once one or two prosthetics companies are in production, it will then be possible for all crippled children's agencies and for voluntary organizations, hospitals, physicians, and others to order functioning artificial hands for children.

We can then study how the loss of an arm affects physical and emotional growth and development and how children can best utilize a functioning artificial hand.

The number of children receiving care in the crippled children's program is quite small, about 250,000 a year. But there are approximately 1,000,000 with orthopedic handicaps, 675,000 with rheumatic fever, 300,000 with epilepsy, 250,000-500,000 with severe hearing impairment, and many others.

We do not know to what extent all these children are getting care from private and voluntary resources, nor how adequate is the care they are getting, nor how many are going without care. Again and again, the experience in the crippled children's programs has been that when a new clinic opens or a new service starts, large numbers of children in need of care appear.

The success you have had in translating research results into organized community programs, together with the growing concern of civic groups, leads me to believe that we are on the threshold of major new developments that will bring to crippled children everywhere the medical, social, and rehabilitative services they need.

Mental Health Services In a Program Of Public Health

4

By Arthur P. Noyes, M.D.
President of the
American Psychiatric Association

In spite of the striking reduction in certain types of illness through public health measures there remains one group of diseases in which there has been little or no reduction and which now fills approximately as many hospital beds as do all other illnesses combined. This group, as you know, is that of mental diseases.

With the increasing insights which psychiatry has brought both into the more or less serious personality disorders of the individual and into his emotional needs and their relation to mental health, this branch of medicine has in its applications tended to fall into one of two fields: clinical psychiatry and community psychiatry. This division is quite arbitrary, and the dividing line is by no means clearly drawn.

Community Psychiatry

In this discussion, our concern is with community psychiatry, which in turn, may be divided into two aspects: one, the positive or health-promoting aspect in which one would include family as well as general community attitudes and activities that afford opportunities and influences favorable to the achievement of

satisfactory social and personal adjustment to the individual; and, two, the diagnostic and therapeutic resources which the community provides for the psychiatric needs of its citizens.

Just as public health is a relatively late development of the general science of medicine so is the first or positive aspect of community psychiatry. If the aim of public health medicine is the extension of life and an improvement in its productivity, the aim of community psychiatry may be defined as the strengthening of personality and the improvement of its adjustment.

Both public health medicine and community psychiatry should be regarded as preventive medicine. From a somatic standpoint, preventive medicine seeks the most efficient physiological functioning possible for the organism. From a psychological standpoint, it seeks the richest possible functioning of the personality.

It is desirable that the body not be exposed to the stresses that interfere with the development of a normal growth pattern.

It is equally essential that the personality not be exposed to stresses that inhibit or distort its development in its process of maturation.

From its early objectives as an agency for the control of disastrous epidemics, public health medicine evolved to a broadly based philosophy of preventive medicine for the person in all of his biological, cultural, sociological, and environmental involvements. It was logical that with such a broad objective the prevention of one of the most frequent and devastating of illnesses—mental disorders—should become a matter of great concern.

Considerably earlier, however, another medical discipline had necessarily become concerned with the treatment of mental disease. For a long time, this branch of public medicine was limited to the operation of hospitals for mental diseases and still is in many States. In others, it has also come to include in its scope the education of the public in respect to the causes and prevention of mental and behavior disorders and to some extent the operation of clinics for their treatment. Perhaps there has developed some overlapping of objectives and functions rather than an integration through one governmental department assigned a comprehensive program of education and of hospitalization.

Somewhere Between

Why has mental hygiene, or the investigation and application of measures designed to establish and maintain mental health, become a function occupying a somewhat anomalous and divided place between two medical disciplines, each charged with public responsibility?

One discipline was originally concerned primarily with such activities as sanitation, control of communicable diseases, prevention of chronic diseases, occupational hazards, crowded living conditions, food handling, and other conditions that affect physical health.

It was gradually found that health problems were not all of mechanistic origin, that many of the problems found in the child health clinic, for example, did not have their origin in infections or malnutrition but in emotional difficulties or in interpersonal tensions. It was observed that most health problems had some related emotional component which for the establishment of most effective health must be dealt with by the techniques of mental hygiene.

It is often said that we have now reached the point in public health where further advance in the protection and improvement of the physical health of the population is beginning to require a mental health orientation. It is becoming well recognized that in its various services a health department meets a wide range of emotional problems.

The other medical discipline which rather naturally began to include mental health within its sphere of interest and activity was psychiatry. At first the establishment of asylums, largely custodial, was its principal contribution. Later as the mental hygiene movement began to gain ground, some of the superintendents began to acquaint the public with social problems created by poor mental health and to encourage the establishment of clinics for the diagnosis and treatment of milder personality and mental disorders.

Programs of mental hygiene in the States have been developed under one of two departments, either the health department or the division charged with administering the mental hospitals of the State. In some instances these two agencies are combined within a single department, along with other divisions of the

government concerned with the health and welfare of the population. Even in such a grouping, the two usually remain relatively separate in their functions.

Some Recommendations

Personally, I believe that in the larger States, at least, the department which controls the hospitalization of mentally diseased persons should be organized as a separate department with its chief executive officer responsible to the governor. Every State, of course, should have a mental health program, a part of which has a logical place in its general health department.

However, just as a psychiatrist is not qualified either technically or by his general orientation to the subject to be the administrative head of a department of health, so too the immediate direction of a department responsible for the operation of hospitals for the treatment of actively psychotic patients can scarcely be undertaken by one who does not have a wider acquaintance with psychiatry than that now acquired in schools of public health. Not every psychiatrist, either, is adapted to mental health work in a public setting. The majority are primarily trained to do individual psychotherapy.

I doubt whether the public health clinic is the setting in which the treatment of major psychiatric illnesses should be undertaken. Many patients who receive health department services do, however, have emotional problems even though they do not give rise to the categorized clinical reactions described in the textbooks.

The anxiety of the patient seen by the public health physician does not usually arise so much from the threat of weakening repressions as from some very realistic situation connected with the circumstance that brought him to the clinic. The anxiety felt by the breadwinner of the family who learned from a mass survey that he has pulmonary tuberculosis is not the anxiety felt by a compulsive neurotic.

Such anxieties are not treated by deep analysis but through the team therapy of the public health nurse, social worker, and the mental health-minded physician. In such a situation there is no place for the isolative tendency of the usual clinical psychiatrist.

But let us turn to the problem of mental health as it is associated with the activities of a State, city, or community health department, in which there should be a special division concerned with mental health. The time has come when public health should have a better understanding of cultural patterns of the community, of the inner feeling states which the public health worker will inevitably meet.

It seems to me that the schools of public health are not yet including sufficient psychiatry in their courses to prepare their graduates adequately for the directorship of a mental health division even though its emphasis will be on mental health rather than on mental disease, on prophylaxis rather than on therapy.

Public health personnel should be taught that many problems not previously considered as in the field of mental hygiene really belong in that sphere, that mental health and other services in a health department should be more closely integrated. There has been too great a tendency to separate psychiatric problems from their original context, a tendency which psychiatrists have unwittingly but frequently encouraged.

It is essential that the liaison between the mental health and the other divisions in the health department be quite close and that there not be the self-contained autonomy so often existing in bureaus. It would be highly desirable for the chief of a psychiatric division in a health department to have had some training in the social sciences, and to be aware of how people think and feel, of how they live within the social institutions and cultural patterns of the community.

Part of the General Health Program

What department should be responsible for the clinic which serves the ambulant mentally ill, the psychoneurotic and the psychosomatic patients? What department should direct such child guidance clinics as are not operated by privately endowed agencies?

All these clinics are primarily treatment in function and should be operated by the department that directs the administration of the mental hospitals, the department that I suggested be administered separately from the health department.

What, then, should be the function of the health department in respect to mental health? This should be preventive. There would be the greatest opportunity for reaching people who most need help and education in mental health matters if a mental hygiene service were integrated into the general health program of the local health officer. In practice, there is a great difference among the States as to the division of the mental functions and activities of a department of public health and those of a department of mental health.

Both types of departments have expanded their activities in recent years, yet there has been a tendency for health departments to be increasingly attentive to prophylactic and public education activities, while departments responsible for the administration of hospitals have increased clinical facilities for mentally ill or maladjusted persons.

Mental disease is one of the largest and most serious of health problems which may be approached by the usual methods of public health—emphasis on education, prevention, early case finding, and prompt treatment. These are the tenets that run all through the working principles of public health.

There is another and in many respects a wider view from which the subject of mental health should be approached. The need and demand for mental health services have become increasingly recognized, yet are so inadequately met and so poorly organized that there is need for comprehensive community programs to be established through local or State legislation.

One State's Findings

I will take the liberty to call attention to some of the conclusions reached by the New York State Mental Health Commission following its survey of the programs for mental health services throughout New York State.

The commission found that nowhere in the State were there adequate mental health services at the community level. Except for a few localities mental hygiene clinics were the only mental health service. At the local level there was no single governmental agency charged with the responsibility for community mental health. In some communities parts of the mental health

program were provided by health departments, education authorities, welfare officials, and by courts, but nowhere was there a central planning body for mental health services. As a result there was overlapping, duplication, and gaps in service, and overextension of their programs by some agencies.

The commission found that at the local level there tended to be fragmentation of services by reason of the fact that financial support, although limited, was available from a number of State departments and agencies.

The commission concluded that mental health services develop best in relation to needs when they are the responsibility of local government even though State financial aid and professional consultation might be necessary. As would be expected, it was found that mental health services have been developed by a variety of public agencies and by a large number of voluntary organizations.

The commission did not recommend the giving up of any existing qualified service. It was of the opinion that comprehensive programming for community mental health requires the combined efforts of health, welfare, education, judicial, and correction agencies, both public and private. It urged coordination and integration by a single, responsible agency of local government.

In reviewing community mental health services, the commission expressed the opinion that no community has a complete program if it does not have these five types of service:

The mental hygiene and child guidance clinics, inpatient psychiatric services in general hospitals, and the case-finding efforts of school systems, welfare agencies, and public health departments.

Rehabilitation services for the discharged or convalescent patient from the mental hospital.

The consultative services provided by trained mental health personnel to the professional staffs of other agencies, such as courts, schools, and welfare departments.

The educational activities carried out by mental health personnel, designed to inform other professions and the general public what has been learned from the clinical relationships

of mental health personnel regarding the problems of human personality.

Specific efforts to deal with facts of community life in such a way as to reduce the frequency with which personality disorders occur.

Other States will watch with much interest this attempt to secure complete and integrated mental health services.

Research in Program Methods and Evaluation In New York State

5

**By Herman E. Hilleboe, M.D., M.P.H.
Commissioner of Health
and George James, M.D., M.P.H.
Assistant Commissioner for
Program Development and Evaluation**

The New York State Department of Health created a new unit in 1952 to assist the commissioner in evaluating the results of program activities and in promoting the development of new public health programs.

The new office is working toward the development of yardsticks for measurement of public health performance and is exploring methods for the determination of health need and accomplishment. It has stimulated local research in the State, in the belief that the future of public health activity in this area of changing priorities will be determined largely by patterns developed through local health activities.

The office of program development and evaluation consists of an assistant commissioner, a cultural anthropologist experienced in public health, a biostatistician, and, on occasion, an administrative officer. In addition to having entire responsibility for statistical services, the director of the office also maintains technical supervision and general communication with all development, evaluation, and research activity in the department.

A few examples will illustrate the scope of this special team's accomplishments.

In Heart Disease and Hypertension

The new office has studied the entire problem of adult heart disease, looking for the best possible public health approach, and with a view to developing a program which would utilize tests for the mass detection and followup of both clinical and preclinical coronary heart disease and hypertension.

Projects of similar nature were visited; the literature was combed, and numerous consultants were asked for suggestions.

The Albany Cardiovascular Health Center project resulted. The center was devised to:

Detect and follow coronary heart disease and hypertension, determining the incidence, prevalence, and progress of these diseases among the participant group—2,000 male State employees in Albany between ages 40 and 54.

Determine the validity, reliability, and efficiency of the various techniques in the detection of these heart diseases during their preclinical or earliest clinical stage.

Develop and evaluate methods of applying these detection tests to large groups of the population.

Develop and maintain research teams which will perform satellite studies around the core testing program.

Offer an excellent periodic cardiovascular diagnostic service to 2,000 susceptible men, sending all pertinent data to each member's physician.

Stimulate and develop the interest of all State health workers in heart disease problems and programs.

Evidence has already been turned up that the history of cardiac symptoms elicited by the physician and the measurement of heart size by electrocardiogram and physical examination are both seriously lacking in reliability.

When the yardsticks for diagnosing and detecting heart disease are thus at fault, perhaps our major attention should be toward improving their scientific accuracy and consistency before further developing their practical application.

Six studies in the general field of heart dis-

ease have already been started, and many more are planned.

In Radiological Health

The protection of the public against dangerous radiation clearly concerns every health department. Radiation may come from naturally occurring radiation elements, X-ray machines, or materials that have been made radioactive by nuclear reactors. Because the use of radiation is increasing, a special problem faces the health officer.

The program development and evaluation unit is studying this problem. Special laboratory and survey equipment has been provided; a promising young sanitary engineer specially trained in radiological health has been appointed, and a technical advisory committee of radiation experts has been named. Existing knowledge on the need for a radiation control program was compiled, and a sanitary code regulation of great scope was recently passed.

An earlier regulation established standards for the 400 shoe-fitting fluoroscopes in upstate New York. This work in ionizing radiation control permitted the field engineers to gain technical knowledge which will be valuable in the more complete program now under way.

Special courses in radiation control are to be held for physicians. The sanitary engineers have already been given intensive training programs in both the field and the classroom.

In a Tuberculosis Program

A special team of well-trained public health people who are not personally identified with the tuberculosis program can often help us in taking a critical look at accomplishments and the yardsticks used to measure them. The new unit has surveyed the accomplishments in tuberculosis since New York's expanded control program began in 1947.

Among the interesting findings were:

The development of special yardsticks for the evaluation of case-finding services.

The clearcut delineation of areas with poor tuberculosis case-finding activities.

The decreasing yield of active tuberculosis found on the mass survey, by X-ray of adult

admissions to general hospitals, and among persons attending chest clinics.

The approximate cost per case of tuberculosis found by various procedures.

The proportion of those screened who are found to have various pathological conditions on followup.

The dramatic decrease in incidence and prevalence of tuberculosis at State mental hygiene institutions and the reasons why it is believed that this decrease is due to the department's efforts.

The great decrease in the number of patients reported as having "tuberculosis—stage undetermined."

The unchanging proportion of cases discovered from death certificates.

The importance of a new plan and studies governing the proper use of State and local tuberculosis hospitals and drug therapy for control of this disease.

In Cause-of-Death Reporting

The literature is filled with statistics based upon causes of death listed on death certificates. The new unit took a critical look at the accuracy and value of these statistics in New York State. By comparisons of autopsy and original death certificates on file, it discovered that while overall death rates might change little because of compensating factors of error, these compensating mechanisms cannot be expected to extend to the other factors associated with the death.

Hence, if these statistics are used as bases for epidemiological studies of what type of person dies from cancer, heart disease, or cerebral hemorrhage, for example, the use of cause-of-death data should first be refined. Also, multiple causes of death must be considered.

Perhaps our most promising point of attack against a chronic disease may lie in the correction of a condition which is not now listed on the death certificate. A simple example of this is the possible effect of obesity control on preventing death from hypertension.

The program and evaluation office has suggested that local health units use special pilot projects in searching out a new approach to the collection, tabulation, and use of cause-of-

death statistics for the assessment of chronic disease needs, programs, and accomplishments.

In a Traffic Accident Study

Many agencies have studied the high annual toll of accidents on the highways, but few have done work along epidemiological lines. Insufficient data are available on the characteristics of the population having a particular risk of highway accident. Some studies by the New York State Public Works Department have pointed out that drivers cannot be divided into those who drive fast or slowly. Rather it has been discovered that almost all drive over the speed limit 15 percent of the time.

The epidemiological problem, therefore, is more a matter of search for situations which make any individual accident prone at a particular time. Such study requires careful attention to social science interview and survey techniques.

The evaluation team devised a special interview questionnaire which was applied to area probability samples in two small cities. Many factors were studied which might be associated with the occurrence or nonoccurrence of a motor vehicle accident.

In another project planned, observations will be made of driver behavior, and interviews will be conducted both on an area probability basis and also on specific individuals observed doing hazardous or nonhazardous activities relating to driving.

In Fiscal Research

Recognizing that for most essential services the cost of public health programs and research will continue to increase and that the money available for these services is reaching its limit, the State department of health, in cooperation with a temporary legislative commission, undertook to study accounting and budget concepts that would be useful in controlling costs and that would provide administrators with a more effective tool for the measurement of alternative courses of action, the evaluation of performance, the development of priorities, and an understanding of the true costs of specific programs.

A State tuberculosis hospital was selected for this. The specific principles or concepts tested were the accumulation of cost by program, function, or area responsibility; the separation of costs into variable and fixed components; the relation of variable cost to workload for the use of standards for planning activities and appraising performance.

It is important to realize that costs alone can never be controlled, for it is the individual who makes the administrative decisions that result in costs. With complete information about the costs of all alternatives to a decision, the top administrator has sufficient fiscal data at his disposal to supervise the person making a decision with a cost implication.

Costs are also expressed in terms of workload, thus permitting public health administrators and others concerned to have a more concrete idea of what specific State appropriations are being used to accomplish an objective.

An important feature of this new system is its value to the health officer in the development of his long-range plans. If he knows the cost of each of several alternate plans, he will be able to adjust his program more readily to the funds allocated by the appropriating body.

Outpatient Management And the New Drugs For Tuberculosis Control

6

By Robert J. Anderson, M.D.
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Division of Special Health Services
Public Health Service

New drug therapy for tuberculosis has raised many questions about tuberculosis control. You are all aware of the dramatic reduction in tuberculosis mortality in tuberculosis hospitals through the use of streptomycin, para-aminosalicylic acid, and isoniazid. At this stage,

however, we should take care lest the spectacular performance of these drugs lead to undue reliance on outpatient therapy in dealing with a disease that still requires hospital management to a major degree.

It seems that isoniazid and para-aminosalicylic acid are for the present the first drug approach. Streptomycin may be held in reserve to cope with treatment failure and drug-resistant organisms.

Studies done by the Public Health Service and cooperating sanatoriums show that the maximum effect on making patient's sputum negative is obtained by not less than 16 weeks of therapy. Beyond 16 weeks of treatment, few of the remaining positive patients become negative, even under continued therapy. This is important in planning isolation of the patient. The momentum of X-ray improvement still continues after 32 weeks of treatment. Long continued drug therapy seems to be indicated, but exactly how long no one knows. Para-aminosalicylic acid is, if anything, a slightly better partner for isoniazid than is streptomycin.

The older the patient is, the longer he has had his disease, the less likely is a favorable treatment result. These observations emphasize the importance of early case finding to achieve maximum effective treatment and to reduce the proportion of patients who arrive at a chronic stalemate in their struggle with their disease.

On the hypothesis that isoniazid may possess prophylactic qualities, the Public Health Service now is undertaking an extensive study to determine the possible value of the drug in preventing complications of primary tuberculosis in children, particularly tuberculous meningitis.

Importance of Case Finding

Plans are now going forward to coordinate the study in pediatric centers throughout the United States and Puerto Rico. Patients selected for this investigation will be treated under a uniform protocol. The results will be assessed centrally by the physicians working in these centers. Possibly the future will see the extension of drug prophylaxis to the prevention

of tuberculous infection in a tuberculous environment.

It has been observed that when the patient's sputum persists bacteriologically positive, in spite of drug treatment, some of the bacilli remaining demonstrate a resistance to that drug. Isoniazid-resistant tubercle bacilli are virulent for some animals and avirulent for others. We do not yet know that the patient who is sputum-positive with some drug-resistant organisms after drug therapy does not spread disease to other humans. This is a challenging subject for an epidemiological investigation of significance to the future practice of tuberculosis control.

Case-finding activities continue in importance in the control of the disease. Not so long ago case finding was held back because no treatment was available for the cases discovered. Now, is it not logical, as treatment becomes more effective, more available, and less costly, that we devote more of our resources to this and the other activities in control?

Changes in Hospital Practice

The effectiveness of the drugs has changed hospital practice, both in therapeutics and in medical administration. Within the hospital there are shifts occurring in the use of such techniques as pneumotherapy, thoracoplasty, and pulmonary resection.

The duration of patient stay is being effected, for patients either obtain maximum hospital benefit earlier or are saved from what previously were progressive and fatal disease processes.

Studies of hospital phenomena are needed to show the exact changes occurring in the way hospitals are playing their role. Earlier discharges are vacating tuberculosis hospital beds. These may remain unfilled to the extent that the rate of discharges exceeds the development of new cases, that outpatient diagnosis and treatment are substituted for hospitalization, and that patients with other medical or surgical problems of the lungs and chest, or with other chronic diseases, are permitted or refused admission.

For practical purposes newly reported cases

are a useful measurement of the incidence of tuberculosis disease. In 1953 the States and Territories reported 113,531 cases of tuberculosis, a decline of only 3.5 percent from 1952. This 3.5 percent reduction in new cases does not keep many tuberculosis beds vacant.

Outpatient Management

Streptomycin, para-aminosalicylic acid, and isoniazid are effective, cheap, and easily administered, leading to an extension of therapy beyond the hospital.

There are several circumstances under which outpatient drug treatment is employed. One, the common practice of continuing treatment after early hospital discharge, seems consistent with the knowledge we possess of the effects of the drugs on sputum status and clinical improvement.

Another circumstance which leads to outpatient treatment was a marked insufficiency of tuberculosis hospital beds for the patients. In the pre-drug era we put patients in waiting lists until we could hospitalize them. Now we put them on drugs.

Long continuous therapy is more uncertain out of the hospital: Patients do not like the routine of taking pills daily, do not tolerate nausea, dislike being jabbed with needles for twice-weekly streptomycin injections. Nevertheless, some improve.

Should I ask you, then, to believe that outpatient therapy, without rest (some patients continue to work), without proper diet, without surgery when necessary, will produce an equal result to hospital management?

Also, an increase in outpatient treatment results when physicians retain their patients instead of referring them to available beds in hospitals and health departments as in the past. For its effect on public health practice, outpatient treatment under this circumstance must be evaluated not alone in terms of patient survival, patient recovery, patient relapse as compared with hospital care data, but also in terms of case reporting, continued case supervision, patient education, contact examination and supervision, sputum conversion rates, and infection rates.

Although we need to define the role of outpatient treatment, for the time being, for the welfare of tuberculosis patients and their families, it is incumbent on us to emphasize the advantages of hospitalization for prompt recovery and the protection of the family.

When a tuberculosis patient is to be an outpatient, the health department should see that he has:

A home environment that will be conducive to optimum therapy, including satisfactory provision for protection of family and neighbors.

Adequate nutrition as demanded by a therapeutic regimen.

Necessary assistance for the family, with direct reference to their financial, social, and psychological needs.

Adequate bedside nursing.

Proper diagnostic treatment and followup services, including radiological and laboratory examinations.

Health education for both patient and family, as a means of maintaining the high level of community protection which institutional care normally affords.

Finally, the drugs themselves, in adequate supply to maintain optimum therapeutic levels.

Preliminary Observations

The Public Health Service has recently undertaken a study of the characteristics of non-hospitalized tuberculosis patients, the kinds of services they are receiving, and how they appear to be faring.

Here are some preliminary, rough observations:

Approximately half of the known active tuberculosis cases are hospitalized, and one-half are at home. Of those at home, two-fifths have drug therapy recommended, and the remainder are at home with no recommendations known to the health department for drug therapy.

Health departments find it difficult to determine which of the known cases at home are active. Preliminary tabulations show that on the average 20 to 35 percent of the known active cases at home have not had a clinical examination or X-ray within the preceding 12 months. A similar proportion have not had a determination of their bacteriological status. Even

though rest and restriction of activity is still considered an essential part of the treatment for tuberculosis, approximately half of the cases at home were not given any specific recommendations in this regard.

These preliminary tabulations indicate that there are very marked variations in the adequacy of care that patients are receiving at home, and that many of them are getting no more home care than in the pre-drug era.

You might say that although the drugs are spectacular there is still no evidence that they can do for tuberculosis what penicillin has done for syphilis. Many cases still need this combination of preliminary hospitalization, surgery, and laboratory control. The drugs should not make us less active in finding cases, keeping patients and their contacts under public health supervision, and educating the public about tuberculosis.

for your P H I

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Public Health in Samoa
The Trachoma Story
Medical Librarianship
A Rural Sanitation Program
Nurses for Hill-Burton Hospitals
Physicians in Public Health

Infectious Hepatitis, 1953 and 1954

Infectious hepatitis was added in 1952 to the list of diseases to be reported weekly, but notification was known to be incomplete for that year. During the following 2 years reporting was much improved and was probably better in 1954 than in 1953.

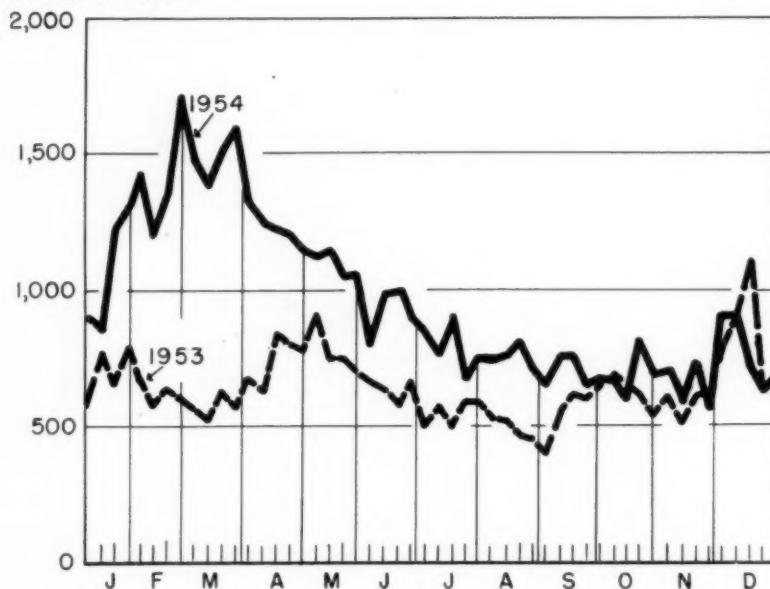
A high incidence of the disease occurred during the late winter and early spring months of 1954. For the corresponding period in 1953, the chart shows a bimodal distribution which probably reflects reporting procedures rather than an actual seasonal trend. Although incompletely reported, the 1952 figures indicate a definite peak in February, as in 1954.

The incidence decreases during the summer months and may reach a low point sometime during the fall months. Sufficient data are not available at this time to establish the season of lowest incidence.

The provisional number of cases reported in 1954 is 49,739 compared with 33,382 for 1953. The large number of cases reported during these 2 years indicate that the disease is a major health problem. This is particularly true in certain areas of the United States. More than a third of the cases for both years were reported from the Middle Atlantic and South Atlantic States. A large number of cases were also reported in the West North Central States, especially during 1954.

This material was prepared by Granville Sylvester and Dr. C. C. Dauer of the National Office of Vital Statistics, Public Health Service.

Number of cases



Infectious hepatitis in the United States, by week: 1953 and 1954.

During 1953 and 1954 approximately 60 reports of epidemiological investigations of outbreaks of infectious hepatitis were received by the Public Health Service. These reports accounted for less than 3,000 of the total cases reported.

Many cases were not considered associated with outbreaks, and reports of outbreaks were not received from many States. Some States probably did not report outbreaks because the cases usually occur over a period of several months as the incubation period of the disease is from 15 to 35 days.

The mode of spread for most of the outbreaks was given as personal contact. Food, milk, and water have been considered vehicles of infection, but in only four instances during 1953 and

1954 was water considered as a possible vehicle. Food and milk were not suspected as vehicles in any of the reported outbreaks, which occurred most often among institutional or school populations. In several instances the disease was associated with unsanitary living conditions and was among persons in the low socioeconomic group.

An unusual characteristic of the disease is the long period, 6 weeks to 2 months, of convalescence from the infection. No successful treatment has been found, and in some cases the infection leaves chronic liver damage. Gamma globulin has been used successfully for prophylaxis. It gives passive immunization and is effective if given to contacts during the early part of the incubation period.

research progress report

To summarize in systematic order the reports of progress in arteriosclerosis research supported by grants of the Public Health Service, Dr. Murray Goldstein prepared for the National Advisory Heart Council and for limited distribution a detailed and documented account of the studies and their relation to the pathogenesis, treatment, and prevention of this disease. Dr. Goldstein is an assistant to the chief, Grants and Training Branch, National Heart Institute, Public Health Service.

The following paper, drawn from the original report, aims to call attention to the general scope of

the research, rather than to evaluate individual findings or to describe them in precise detail. At this stage, with so much still unknown and with many studies still in progress, it is not possible to establish an accurate perspective. Also, this paper excludes much valuable work that is unpublished or is supported by institutions other than the Public Health Service. Compressing the information and arranging it in this context has inevitably resulted in somewhat arbitrary statements and has perhaps strained the intended meaning of the reports by the scientists.

Arteriosclerosis Studies

RESEARCH in cardiovascular health is a prime function of the National Heart Institute, a division of the Public Health Service. Since its founding in 1948, in addition to conducting research in Government laboratories, the institute has granted more than \$3.5 million to universities and other institutions to support research related to studies of arteriosclerosis. Most of this amount applies to studies which are still in progress.

The pattern of this research is determined largely by the applicants for grants. The scientists themselves pose the questions which must be answered in advance of further progress in the field.

Definition and Classification

Relatively few grants have been sought for defining the entity of arteriosclerosis, that condition marked by loss of elasticity, thickening or hardening of the arteries, or atherosclerosis, a specific type of arteriosclerosis characterized by lipoidal and plaquelike changes in the innermost layer of the artery, the intima. One definitive project classifies an entity known as coronary

heart disease, from studies of heart muscle lesions. Correlated clinical findings and electrocardiograms are offered to support this diagnosis.

Experimental Studies in Pathogenesis

The need to develop experimental techniques is both primary and chronic in the search for contributing factors in arteriosclerosis. The successful use of animals to induce sclerotic processes comparable to those in man began with Anitschkow's work with rabbits in 1908. Since then, experimental studies have employed guinea pigs, rats, dogs, cockerels, chickens, rabbits, and Cebus monkeys. Work supported by the Public Health Service has produced many basic contributions to experimental techniques, involving control of diet, administration of chemicals, action of hormones, transfusion of serums, physical injury, genetic influences, and the effects accompanying aging.

An early need in experimental techniques was to develop simple and reliable methods of inducing the process of arteriosclerosis. Cholesterol, a lipid found in animal fats and oils,

whole milk, egg yolk, liver, and certain forms of seafood, was associated with the sclerotic process by Anitschkow. Since diets high in cholesterol do not invariably produce the condition, other contributing forces have been looked for. Low thyroid activity is one. Arteriosclerosis develops in dogs fed a high cholesterol diet supplemented by thiouracil, a chemical which reduces the production of thyroid hormones. The thiouracil does not so affect dogs on a normal diet.

Readings of cholesterol in the serum of dogs are used in efforts to predict the severity of arteriosclerosis. The injury regresses if the serum cholesterol falls below a certain level. Once the necessary fatty state in serum is established, arteriosclerosis may develop in a matter of days or even hours.

Instead of using thiouracil or thyroidectomy to induce arteriosclerosis in dogs, a laboratory may save time and effort by using radioactive iodine to depress thyroid activity. Curiously enough, the loss of thyroid activity resulting from surgery, followed by an associated rise of cholesterol in the blood, does not produce coronary atherosclerosis in patients with a history of cor pulmonale, a heart disease secondary to disease of the lungs, or rheumatic heart disease.

A process for inducing atherosclerosis for experimental study, without prolonged cholesterol feeding, consists of planting diethylstilbestrol, a synthetic chemical with action resembling a female sex hormone, under the skin of a chicken. This chemical produces a sustained condition of excess lipid in the serum of chickens and, consequently, arterial lesions which closely resemble those found under controlled conditions.

Rats resist efforts to induce arteriosclerosis even when diabetic, although it is common to find atherosclerosis associated with diabetes in humans. On spectral analysis, the fatty proteins in rat serum differ from those of other experimental animals. Rats, which fail to develop a high level of cholesterol in the blood on a fatty diet, rapidly develop such a condition on the identical diet when rabbit serum is transfused into them. This experience suggests that the difference between rat and rabbit plasma may be the basis for the difference in susceptibility of these species to arteriosclerosis.

A study of the relation between physical in-

jury to the artery wall and the formation of atheromatous plaques finds that weanling albino rats are remarkably resistant to the consequences of injury induced by injection of sodium acetylsulfathiazole. The severity of the consequent lesions increases with the age of the rats injured. Injury to the artery wall of rabbits subsequently fed a high cholesterol diet produces a lesion similar to human arteriosclerosis. Of associated interest, microscopic studies reveal hemorrhage within the artery wall in sudden human deaths from coronary artery disease and coronary atheromatosis.

Fundamental Studies

The driving forces in the arteriosclerotic process may be in the fluids surrounding the artery wall, in the behavior of the cells of the wall itself, in various forces of environment or custom, in genetic influence, or in a combination of several conditions.

The Artery Wall

Studies of the cellular metabolism of the artery wall itself have been stimulated by the realization that atherosclerosis may occur without the appearance of excess fat in the plasma. One such study demonstrates that the rat artery may convert acetate into fatty acids and can incorporate phosphorus into the phospholipid molecule. The artery wall itself thus can contribute to the production of lipids. To facilitate similar studies, an investigator has developed a technique for measuring the metabolism of intact arterial tissue under aseptic conditions.

Some spontaneous coronary artery lesions of birds are found to be fibrotic rather than fatty; fats may have a late part even in the forming of arteriosclerotic plaques in the aorta of old dogs. Another investigation finds that mucopolysaccharide deposits occur before the lipids. These studies are associated with other efforts to work out the precise cellular history of what appears to be a proliferative and degenerative disease.

The aging factor in the arteries has been associated with the formation of bone or cartilage in the aorta of senile rabbits. Calcification of the media, another sign of aging, is said to precede the formation of intimal plaques, although this

conclusion is not supported by other studies. Autopsies demonstrate that arteriosclerosis increases with age in both sexes. It is more severe, however, in the male. The relatively greater susceptibility in boys appears before their 10th year.

Still other techniques are being developed to pursue the study of the role of the arteries in the hardening process.

The Artery's Surroundings

Studies of the artery's chemical and physical environment deal with three main fields: cholesterol and phospholipids; lipoproteins; and physical forces, including blood stream pressure and turbulence.

The presence of cholesterol and its esters in diets, in plasma, and in arterial plaques associated with arteriosclerosis has commanded particular attention.

The work of identifying, measuring, and exploring the metabolic processing of these lipids deals with the production and destruction of cholesterol, the differentiation between cholesterol taken in the diet and that formed by the body, and the activity of "trace companions" of cholesterol as atherosclerotic agents.

The fate of cholesterol in the intestine is affected by certain micro-organisms and by chemical conditions which may prevent or accelerate its absorption into the blood stream.

The liver is the chief organ for removing excess cholesterol from the blood. It excretes 60 percent of the excess as bile acid. When unknown forces prevent the return of plasma cholesterol to the liver cells, an excess of fat appears in the blood.

Young animals appear to form more cholesterol in the liver than their elders. Low calorie diets reduce the rate of such formation; high calorie diets restore it. The rate is depressed by a high fat diet, which also seems more effective than a low fat diet in removing cholesterol accumulated in the liver of rats. A high level of cholesterol in the blood does not appear in dogs with deficiency of magnesium or in the liver of rats with a deficiency of pantothenic acid. A deficiency of pyridoxine is accompanied by a high level of cholesterol in the blood of Cebus monkeys and rats, but not in rabbits. Even with a calorie deficiency, chicks on a high

cholesterol diet have excess cholesterol in the blood and develop atherosclerosis. As calorie intake rises, successive increments of blood cholesterol decrease. Other dietary fats in combination with cholesterol appear to induce higher fat and cholesterol levels in human blood than cholesterol alone.

Detergents, which have a wetting action that keeps fats and oils in suspension so that they do not cling to affected surfaces, increase all blood lipid components, especially phospholipids. An increase in phospholipids appears to retard or prevent atherosclerosis. The ratio of blood cholesterol to blood phospholipid (C/P ratio) may be of importance in retarding atherosclerosis.

Two substances found in the blood stream, known as lipfanogen and antilipfanogen, respectively, support or oppose the forming of visible fat granules in tissue culture. As cholesterol combines with antilipfanogen, the opportunity for lipfanogen to create fat is enhanced.

Obstruction of the bile duct has been associated with high cholesterol levels in the blood. On the assumption that these levels are supported by the action of retained bile salts, it was discovered that cholate impedes the transfer of cholesterol from plasma to liver. High blood cholesterol may be a development secondary to disorder of cholate metabolism.

In addition to occupation, housing, and dietary patterns, genetic factors may be significant in the tendency to form cholesterol.

Cholesterol and phospholipids in blood exist in combination with proteins rather than in a free state. Such combinations are known as lipoproteins. The amount of lipids in such proteins is measurable by a flotation process which permits analysis according to the density of various classes of lipoproteins in plasma. These are classified in terms of Svedberg flotation (Sf) units. Four laboratories engaged in such investigations are participating in a cooperative study on lipoproteins and atherosclerosis.

Efforts to measure the volume and forms of lipoproteins in the blood and in fixed tissues are proceeding with the prospect that these measurements may help to predict the imminence of atherosclerotic change, to diagnose the present degree of atherosclerosis, and to guide the management of the condition and its consequences.

If it is determined what classes of lipoproteins are most formidable, preventive or therapeutic measures may follow.

Because the level of serum cholesterol and lipoprotein has been found to vary in men over a 10-week period or more, single readings may not serve as a reliable indication of a patient's condition.

The liver, one of the organs which produce lipoproteins, increases its output of certain classes if it is chronically inflamed or if it is poisoned by carbon tetrachloride. Hepatectomy causes a gradual decline in all lipoproteins.

Animal species vary in their typical patterns of lipoproteins and in their susceptibility to the effects of different lipoprotein classes. Young women have more alpha lipoprotein fractions (associated with alpha globulin) and fewer beta fractions than young men. Many men and older women tend to have lower levels of albumin and alpha lipoproteins and relatively higher levels of beta lipoproteins than young women. (This information correlates with the greater tendency of men and older women to develop atherosclerosis.) The same tendency appears in patients with clinical signs of atherosclerosis, as well as among persons with diabetes, nephritis, and xanthomatosis, even when their cholesterol or C/P ratio is not elevated. The level of Sf 12-20 beta lipoproteins is higher in persons with diabetes if they are also arteriosclerotic. The concentration of such lipoproteins has been reported to be a more accurate indicator of atherosclerosis than the cholesterol level. In some circumstances, it is this lipoprotein factor which links obesity with atherosclerosis.

Effects of heparin, a normal trace constituent of the blood, are undergoing extensive study in the search for a chemical which may influence the formation of arteriosclerosis.

Physical forces examined in relation to arteriosclerosis include surface tension (detergent action), filtration of fats by artery and capillary walls, turbulence of blood in the aorta of rabbits, and elevated blood pressure (hypertension). Although hypertensive patients show a high incidence of arteriosclerosis, the experimental evidence so far does not establish that the one condition necessarily induces the other.

Clinical Studies

There have been no research projects on the incidence of morbidity from arteriosclerosis because of the difficulties of reliable diagnosis.

A reliable method by which the incidence or severity of arteriosclerosis could be measured objectively has been the goal of many investigations. Determinations of serum cholesterol, cholesterol tolerance, lipoprotein fractions, phospholipids, cholesterol-phospholipid ratio, lipanogen-antilipanogen ratio, or neutral fat have been suggested as possible indexes of the probability of developing or having already developed arteriosclerosis.

In man, excluding histological study after biopsy or necropsy, the only reliable method of diagnosis at the present time depends on the onset of symptoms associated with a decreased blood supply to specific organs or parts of the body. For better objective evaluation of these observations, many methods and devices have been suggested and are being perfected; some of these are flicker flame photometry, plethysmography, ergometry, electrocardiography, vector cardiography, ballistocardiography, vascular catheterization, roentgenography, and angiography. As yet, no generally acceptable means has been agreed upon for the preclinical diagnosis of arteriosclerosis.

Prophylaxis and Therapy

Diet, medication, surgery, and rehabilitation are being studied as means of preventing or treating arteriosclerosis.

The administration of adrenal cortical and corticotrophic hormones is associated with high levels of cholesterol and lipids in the serum without an increase in lipoproteins or in atherosclerosis.

The relative susceptibility of males to arteriosclerosis has encouraged studies of the effects of synthetic and natural sex hormones on the occurrence and treatment of this disease.

Studies of thyroid effects find that administration of thiouracil or thyroidectomy does not cause regression of arteriosclerotic lesions in dogs.

After biological experiments indicated that

a portion of the mammalian brain affects the movement of cholesterol into the blood stream, a lipid-poor, cholesterol-free residue of this organ was fed to patients with arteriosclerotic heart disease and a high level of cholesterol in the blood. Their serum cholesterol fell "significantly," presumably as a result of the chemical effect blocking the absorption of sterols in the intestine.

Common "lipotropic agents" necessary for fat metabolism, such as choline, methionine, and inositol, have no beneficial effects on the incidence or severity of arteriosclerosis. Ferric chloride decreases absorption of cholesterol from the alimentary canal but not its production by the liver. Other chemicals which reduce absorption are sitosterol and dihydrocholesterol.

The prospect of prophylaxis by diet is not materially brightened by studies to date. A decline in Sf 12-100 lipoproteins accompanies a loss of weight. The Kempner rice diet reduces serum cholesterol and the C/P ratio. It is not certain that restriction of cholesterol in the diet will ordinarily reach the level needed to produce clinical results. The amount of cholesterol in the diet may vary widely without

producing marked effects on the levels in the blood. Restriction of cholesterol in the diet must be accompanied by considerations of total nutritional needs, such as the part proteins play in lipid metabolism.

Surgery to repair or replace vessels damaged by arteriosclerosis has employed a variety of techniques. These include generation of inter-coronary vessels in a heart inflamed by abrasive asbestos powder; grafting of substitute arteries which have been dehydrated or taken out of cold storage; the use of prosthetics made of metal, plastic, latex, or thorotrast; and the patching of arterial walls with peritoneum. The technique of grafting has evoked studies of optimal length, source, structure, sterilization, and storage of blood vessels.

Studies of rehabilitation of cardiac patients are actively encouraged. Energy requirements, as measured by oxygen consumption, are being measured for various occupational activities.

Most of the clinical studies noted here are undertaken in association with experimental laboratory studies, in order to assure that the patient will have the advantage of validated theories, technical experience, and full understanding of the biochemical factors.

PHS films

Arthropods of Public Health Importance

35 mm. filmstrip, sound, color, 7 minutes,
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Audience: Entomologists, parasitologists,
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Available: Loan—Public Health Service,
Communicable Disease Center, 50 7th
St., NE., Atlanta 5, Ga. Purchase—
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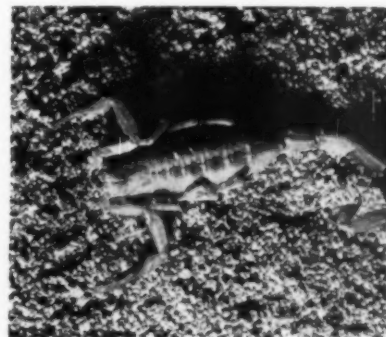
Arthropods of public health significance are featured in this filmstrip.



Rhodnius prolixus, a kissing bug

It shows the outstanding characteristics of some of the more common insects and in a few instances gives the life cycle of one or more species of a particular arthropod. Included

are: cockroaches, mosquitoes, flies, bedbugs, *Triatoma*, fleas, lice, scorpions, tarantulas, spiders, centipedes, ticks, and mites.



Centruroides, a poisonous scorpion from Arizona.

Legal Note

on public health

Court Acceptance of Delayed Birth Certificate Filed by Court Order

The recording of a birth certificate was held by the Federal District Court, in the case of *United States v. Casares-Moreno*, 122 F. Supp. 375 (S. D. Cal. 1954), to be only prima facie evidence of its validity, even though it was filed pursuant to an order of the Superior Court of Los Angeles County, and was subject to rebuttal.

The defendant, on trial as an alien who attempted to enter the United States after his deportation, produced a public birth certificate, filed with the California registrar under delayed filing procedures, showing that his parents had given birth to a son in the United States. The birth certificate indicated on its face that it was offered for filing pursuant to order on August 13, 1936, of the Superior Court of Los Angeles County.

The prosecutor, in rebuttal, contended that the son born in the United States was not the defendant but his brother and that the defendant had taken the name and identity of the brother.

The jury found that the defendant was not born in this country.

The defendant did not contest the court's proposition that ordinarily an instrument which the law required to be recorded is only prima facie evidence of the validity of the instrument. He did contend that since the birth certificate in question was recorded pursuant to an order of the superior court it thereby gained some higher status and became a judgment which under the full faith and credit clause of the Constitution had to be treated as a conclusive adjudication of facts stated therein.

The Federal District Court rejected this contention on the following grounds:

"There is no indication that the California Legislature intended to raise records or parts of records so belatedly established to any greater status than the normal registration records which are never, in cases of birth recordation, to be taken as irrebuttable evidence. In other words, it appears that the role of the superior court in ordering the recordation partakes of an administrative function. It is merely an act of recordation which has been permitted by judicial action rather than by an administrative officer. The judgment in such action is not that the facts so found are absolutely conclusive as between petitioner and the rest of the world, but rather, the judgment is that the registrar is ordered to make such a recording."

The court went on to say:

"It is important to note that even if the California Legislature did intend that such a determination was conclusive (which this court finds it did not intend to do) such an intention would, most probably, run afoul of Constitutional prohibitions. Making such an ex parte appearance conclusively establish the facts surrounding a person's birth or death might well infringe on and conclusively determine the rights of any third person having contractual or other relations with, and regulatory duties concerning, such person. This would appear to deny such third person due process."

For a similar holding see *Ex parte Lee Fong Fook*, 74 F. Supp. 68 (N. D. Cal. 1948), where the Federal District Court held that jurisdiction to adjudicate citizenship status of a United States resident has never been conferred by Congress on State courts and, consequently, any State court judgment purporting to exercise that jurisdiction cannot, to that extent, claim of the Federal courts full faith and credit.

*Prepared by the Office of the General Counsel,
Department of Health, Education, and Welfare.*

Evaluating Program Progress

By ANDIE L. KNUTSON, Ph.D.

EVALUATION is concerned with determining value or worth. Each of us is constantly making evaluations in our everyday lives. We judge ideas or actions in terms of right or wrong, good or bad, honest or dishonest, and practical or impractical so frequently and so quickly that we are often unaware that we are doing so.

We draw upon the full range of our experiences in making these judgments or evaluations, testing each one against our personal and professional patterns of value or concern and against estimates of their relevance to the situation at hand. This weighing process may be either conscious or subconscious, objective or intuitive. Thus, decisions are often made without adequate consideration of pertinent facts available; sometimes they are made without considering the possibility of obtaining such facts.

Program evaluation is concerned with determining the worth or value of efforts to achieve a given purpose or objective. The specific purposes of evaluation in this situation are to provide objective estimates of achievement and to provide guidance for the conduct of program activities. To achieve these purposes, two types of evaluation are required—first, “evaluation

of program achievement” and second, “evaluation of program progress.”

Sound evaluation studies of program achievement are essential if we are ever to know whether or not we are attaining the goals for which we strive. The public, too, has a right to know whether our efforts and money are well spent.

Concrete and valid evidence of the achievement of public health programs is frequently most difficult to obtain. Many of the objectives are broad and hard to reach. Often we may not reasonably expect observable positive results until the program has been under way for years. With some hold-the-line operations, failures are easier to define than successes. Many outside influences quite apart from public health efforts may effect the achievement of the long-range objectives in positive or negative ways. On-going program activities must be continued in the best possible manner even in the absence of the measures of achievement which are only available after the program has been in operation for some time.

Program Progress

Thus, the process of evaluating program achievement is not adequate for satisfying the second of the two objectives of evaluation—providing guidance for program activity. To achieve the purpose of program guidance, objective data need to be obtained and applied throughout the phases of program planning, development, and operation. Objective evaluation must take its deserved role as part of the daily routine of each health worker.

Dr. Knutson, chief of Behavioral Studies, Division of General Health Services, Public Health Service, presented this paper in part at Pennsylvania's Third Annual Health Conference held at State College, August 1954.

In the course of evaluating program progress, it is possible to identify difficulties or barriers as they occur and to make necessary changes on the basis of the best objective data available. Sound evaluation of progress made as a program continues day by day can help to assure that each new phase of the program is built on the positive achievements of the preceding phases.

The concept of evaluating program progress is of value whether we think in terms of the health department program as a whole, in terms of a particular program, or in terms of the efforts of the individual health worker with his personal and team responsibilities.

The purpose of evaluating program progress is to improve the quality of decisions made at any point during the planning, development, and operation of a program.

Since many programs are in operation concurrently in any health department, different types of decisions may have to be made at the same time. Overlappings occur, but for the purpose of this discussion, I have grouped the program decisions to be made into the four broad types of those concerned with:

1. The nature of the interests, wants, or needs the program is intended to satisfy.
2. The broad purposes of the program and the philosophy of approach or policies to be followed in trying to achieve these purposes.
3. The selection or development of the methods, techniques, or procedures to be used in the program.
4. The application of philosophy, policies, and methods in carrying out the operation of the program.

Interests and Needs

We all tend to assume that other people want and need the same things that we would want and need if we were in their situations. We assume we know what they need, without recognizing that in making that assumption we are making a decision. An important question of progress evaluation is: Have the interests, needs, or wants we are trying to satisfy been adequately identified?

Exploratory fact finding is one way of assuring adequate identification of needs or wants.

Questionnaires, interviews, projective tests, group discussions, analysis of statistical data—all sorts of techniques can be used to gather necessary data. Whichever method is used, it is important to try to obtain the other person's identification of needs or desires from his point of view—as he describes them. We need to be careful that the very nature of our questions or approach does not limit his thinking to our own ideas about the possibilities.

The methods of obtaining data for use in evaluating program progress do not need to be complicated. In fact, often the simplest method yields the greatest return.

The nurse who encourages a mother to pour out her troubles and waits patiently for her to identify the things with which she needs help is applying one of the best exploratory techniques. Sometimes simply helping the mother to formulate the problem clearly will enable the mother herself to identify some constructive action to take. Maximum value of the technique occurs when the nurse makes sure that she has given some help on as many as possible of the specific things identified. Referring the mother to some other source of assistance is sometimes as effective as providing her with materials or guidance. Knowing how the mother perceives her problem may be the key to developing an effective solution. If the solution is meaningful to her, there is a much greater likelihood that she will carry out the action after the nurse leaves.

No public health worker has the time and opportunity to make a thorough study of the other person's interests, wants, and needs every time a decision has to be made. But all of us can profit by identifying as a decision each assumption we make about needs and by being as objective as we can in making that decision. We can all profit also by trying out the more thorough method of exploration with a part of the case load. For example, it might be possible to apply this principle regularly on the first home visit or restaurant inspection carried out each morning. Although initially more time will be spent in these instances, the additional effort may help to identify and solve problems that might otherwise drag on indefinitely.

The same principle applies in identifying community needs. Recently a health educator

in a local community seeking to identify the needs upon which to build a sound health education program first made a survey of public health needs. She identified little that was new or unexpected and was unhappy with the findings because she was certain many health problems were not being reported.

She reviewed her approach and found that she had used questions about health needs and public health problems that meant more to the public health worker than to the people she was interviewing. She had encouraged responses in terms of existing services only and her own ideas about new possibilities. On the basis of this evaluative review, she changed her approach and tried a more open interview which encouraged the respondents to discuss freely the little things families run into when they first move into the neighborhood.

Using this new method, she found that many were concerned about uncontrolled dogs roaming the neighborhood. Others mentioned the need for some type of recreation facilities for preschool children who were playing in the streets since there were no sidewalks. Expectant mothers did not know where to reach the nearest physicians. Mothers with young children desired help on behavior problems. Thus, the open question approach, which was focused toward identifying the problems from the mothers' point of view, yielded data of great value in defining the goals for a community action program.

Purposes and Philosophy

The second major type of program decisions to which progress evaluation can contribute are those concerned with the development of the purposes and philosophy of the program. The second question can be stated as follows: Have the program objectives and philosophy and policies been fully agreed upon, formulated, and written down?

Misunderstanding about the broad purpose of a program and the philosophy of approach or policies to be followed in trying to achieve this purpose is a common source of friction. Often sources of potential conflict can be identified in the beginning of the program through frank and open discussion by all persons directly con-

cerned. Writing down agreements helps to assure clear and workable formulations.

In one instance, discussion along these lines after a program had been in operation for 5 years revealed serious misunderstandings among the members of the staff. Some had perceived the project as a community demonstration program to be discontinued as soon as the local health department was prepared to take over. Others saw it as a research project to test methods of diagnosis and control. They were unaware of the problem of preparing the community for its role. A few perceived it as a program to provide services and seemed unaware of any other purposes. Those who clearly identified the purpose as a demonstration were in disagreement about what they were trying to demonstrate and to whom.

Stating the goals of a program in terms of specific health practices is a good way of keeping plans concrete and practical. This is more than an exercise; it is a test of sound planning. Unfortunately, some of our health objectives are long range and hard to pin down. When they can be specifically identified in this way, however, methods of achieving them can be selected with greater confidence.

If the goal is to influence a specific health practice, such as food handling, it is possible to find out how this particular practice is related to the habit patterns and interests of the people concerned. We need to know how the program ties in with their ways of thinking and behaving, with their way of life. For it is unreasonable to expect ready acceptance of health practices that conflict with personal interests or deep-seated habit patterns.

Clear formulation of objectives requires identifying the intermediate goals that need to be achieved in order to attain the program objectives. Almost any program can be broken down into intermediate steps that can be measured. If the measurement shows that the step has been achieved, one can feel confident in going forward to the next step. If the data suggest that this intermediate step has not been attained, it will be important to find out the reason for failure and pause long enough to find a more effective method for achieving the intermediate goal.

In evaluating progress, it is important to dis-

tinguish between the housekeeping type of data required for administration and data that yield evidence of progress. For example, the number of home visits or restaurant inspections made are administrative types of data, as are also the number of telephone calls, pamphlets or leaflets prepared and distributed, films used, and meetings or discussions held. They are accounts of activities carried out as part of the program. They may or may not contribute to the achievement of either intermediate or long-range goals. Accounts of such activities do not yield valid evidence of program progress.

A public health nurse, for example, may keep a record of the number of home visits, how much of her time was spent in the home, what materials were left with the mother, and what instructions were given. Such records are often necessary for administrative reasons.

In evaluating her own progress during a home visit, however, the nurse needs answers to questions like these: Did she find out from the mother what problems she was most concerned about? Did the mother have full opportunity to define the problem? Was each question answered specifically and satisfactorily when the question was raised? Did the mother have an opportunity to tell what she already knew and what she had done in trying to solve the problem, and what important steps she thought ought to be taken? Did the nurse in some way obtain the mother's interpretation of any instructions or suggestions given, and in this way make sure that the instructions were correctly interpreted? Did she take the time to observe the patient carrying out the action recommended? Answers to such questions will help the nurse evaluate her progress in assisting the mother to solve her problems.

Methods and Procedures

A third group of decisions to which progress evaluation can contribute are those concerned with the selection or development of the methods, techniques, and procedures to be used in the program. The question of progress evaluation with respect to this third area is: Is the method or approach selected the one most likely to prove successful in achieving the objectives of the program?

If the purposes of the program have been broken down into specific intermediate goals, a long step has been taken in identifying the best methods and techniques to use.

The final choice of program method can be tested by listing in one column the objective evidence for a method, say interview, film, or pamphlet, and in a parallel column the objective evidence against the use of that method. Try this for each method under consideration. Consider questions like these: Is there any objective evidence that one method is more effective than another in changing behavior or in achieving any other purpose you may have in mind? What will it probably cost in time and money to achieve your purpose by each method? What type of personnel is required to apply it? Are the necessary resources available? Considering the resources available, is it realistic to try to apply the method as a way of achieving the ultimate objective?

For example, the sanitarian may be concerned with the problem of eliminating rat-breeding places and fire hazards in the community. One solution suggested may be to visit homes and offices to give individual instruction to persons responsible for these conditions. Before undertaking this method, he would probably find it profitable to ask: How much would it cost in time and money to visit all the homes or offices and discuss the problem with the owners? What type of person would be required to carry out these visits effectively? Are there such personnel available? Do they have the means of transportation and funds for travel to these places? How long would it take to make all the visits? Considering the answers to these questions, is the method practical? Could some other method be developed which would better satisfy these criteria?

On the same grounds, one might question the advisability of continuing other methods that require a heavy expenditure of professional time to reach only a few of those members of the community needing assistance, such as the use of professional personnel to give individuals or small groups instruction on weight control. How many professional people will it take to complete the job in your community working this way?

If the problem is to identify tuberculosis car-

riers among older men in the marginal income group, one might ask whether the diagnostic facilities are made available to them at a time and in a way that does not interfere with their prime job of earning a living. Are they all likely to be reached by the method used? Are they likely to understand the purposes of the program and will it make sense to them?

It is often useful in identifying or developing a program method to identify systematically the individuals who are in a position to influence the flow of ideas between ourselves and the person with whom we are seeking to communicate. In a local area, the influential person may be a minister, political ward leader, county agent, employer, storekeeper, or club secretary. These individuals are sometimes called communication gatekeepers since they may open the door and encourage the free flow of ideas, or they may close the door and prevent the ideas from passing through. They may influence the acceptance of an idea by lending it their prestige and support. Or they may draw influence from it by deprecating it. They may willfully distort the idea if they are so motivated. Or they may unknowingly change its meaning through failure to understand and thus err in its interpretation.

For example, a man may have a sore on his lip that does not heal. He may not know where to go to get help. After talking it over with members of his family or possibly a friend, he may bring his problem to a pharmacist, a minister, or someone else whose medical judgment he respects. Whoever it is may direct him to a physician who is able to diagnose the problem and provide adequate treatment. Or the adviser may direct him along some futile route by suggesting the use of a home remedy or patent medicine, or by sending him to some other unqualified source of information and in this way block his efforts to get expert help.

Many of the problems we encounter in carrying out public health responsibilities directly involve one or more such communication gatekeepers. We need their help. Analyzing a program in terms of the communication gatekeepers will help to identify them and to define their possible roles so that methods can be developed to enlist their support. Pinpointing efforts to these members of the community will

help open new channels through which we can effectively communicate with the public.

Operation of Program

The fourth group of program decisions to which progress evaluation can make a contribution are those concerned with putting the philosophy, policies, and methods of the program into practice. Questions of progress evaluation concerned with the actual operation of the program include: Do people understand the purpose of our efforts? Is the purpose one they want to achieve? Do the practices we recommend make sense to them? Are these practices in accord with the ways people usually behave? Are our attempts at communication successful?

A clear understanding of purpose is essential to correct action, particularly when the individual himself is the only one who can decide when or how to act. Failure to understand why is one of the most serious sources of program failure. Yet the cause of failure can often be avoided by the simple practice of obtaining the other person's interpretation of purpose.

A nurse in Minnesota related a clinic experience that will illustrate. A mother at a well-baby clinic was advised to put her child on orange juice. A few days later the child was brought back ill, and an examination revealed that the child was starving. The mother had perceived the orange juice not as a supplement but as a substitute for the former diet. To avoid a recurrence of such misunderstanding, the nurse now uses various ways of drawing from the patient an interpretation of how she will go about carrying out new instructions and why it is important to do so.

This same technique of testing to see whether the purpose is understood can be applied to posters, pamphlets, films, exhibits, and even group discussions. It is a very useful tool for identifying words or concepts that cause difficulty. In testing one poster on safe waters it was found that some people interpreted the poster to mean that "all waters should be polluted." Changes were clearly indicated.

Members of the American Public Health Association Committee on Exhibits have had some very interesting experiences in applying this

quick and easy approach. Exhibit evaluators ask each exhibitor to complete in about 25 words this sentence: "The main purpose of this exhibit is . . ." Then they ask a number of members to complete the same sentence while observing the exhibit. In one instance all the observers wrote, "The main purpose of this exhibit is to demonstrate the various uses of isotopes." The exhibitor wrote, "The main purpose of this exhibit is to demonstrate various techniques for testing laundry equipment."

A somewhat similar approach can be used to test whether the practice recommended makes sense to the other person and whether he can easily apply it in the manner intended. A Public Health Service psychologist is studying patient reactions to a low sodium diet booklet. As part of the test, he and his wife went on the recommended diet for several days. They came out with new respect for the difficulties faced by the patient. They had considerable trouble, for example, in using the index, which had been set up from the point of view of a nutritionist, to find such common food items as peanut butter and salad dressing.

A Public Health Service nurse in developing materials for the use of diabetics tried to carry out the exact process outlined in the instructions for injecting insulin. She found it physically impossible to perform all the tasks alone as recommended.

Many health departments are now routinely using tests to tell whether their written materials will be understood by the groups for which they are prepared. The Dale-Chall and the Flesch tests of readability are easy to use. The Flesch test requires only a count of the number of syllables per 100 words and the average number of words per sentence. With these two facts it is possible to estimate the grade level of reading ability required. After some training, any clerical person can apply the test successfully.

For example, one health department, while carrying out a mass X-ray campaign for tuberculosis, received 3 or 4 calls a day from people who asked for an explanation of the notices they

had received about the X-ray findings. An analysis of the reading ease of the notice showed that about eighth grade reading ability was required to understand the message; thus the message could be understood by only about half of the adult population of the community. Since it was important that everyone understand this message, it was simplified to about the fourth grade level of reading ability; then it was tried out on a number of people with low education to make sure that they interpreted it correctly. The health officer has since reported that no calls for explanation are now received.

Major emphasis has been given to the approach of the social scientist rather than to that of the statistician, administrator, or personnel officer. Actions taken in selecting and assigning personnel, for example, directly affect most of the decisions discussed.

One frequently hears that "public health is people," that it is "everybody's business." If public health is so intimately concerned with people, then how well public health is succeeding in its programs may depend on how well our programs are wrapped around people—their needs, their wants, their hopes. The approaches I have been discussing are the types of approaches which are useful in determining whether we are wrapping our programs around people or whether we are attempting to wrap people around our programs.

Through applying the tools of measurement, we can obtain data for the guidance of program improvement as the program continues. We must always be aware, however, that the data obtained in evaluating program progress are not valid for determining whether or not the broad goals of the program are achieved. For this purpose, sound studies of program achievement are essential. Both evaluation of program progress and evaluation of program achievement are essential to satisfy the two major purposes of evaluation—guidance for the conduct of program activities and objective estimates of achievement. Neither can be neglected if we are to make certain that our efforts and money are well spent.

An Outbreak of Salmonellosis Traced to Watermelon

By GILBERT E. GAYLER, M.D., ROBERT A. MacCREADY, M.D., JOSEPH P. REARDON, M.D.
and BERNARD F. McKERNAN, M.D.

WATERMELON as a vehicle in salmonellosis outbreaks is not thought to be an important public health hazard, but its possible danger should be recognized by public health officials.

This paper describes an outbreak of salmonellosis spread by watermelon. To our knowledge, its previous occurrence has never been reported. Indeed, while meat products, fowl, eggs, salads, and, occasionally, pastries are common vehicles of *Salmonella* infection, fruits are seldom implicated.

Epidemiology

Early in June 1954, 17 cases of gastroenteritis occurred in Upton, a rural town in Massachusetts. The 17 cases involved 5 family units, with ages of the patients varying from 2 to 80 years. The patients all had initial symptoms on the same day or the next day. The symptoms were those of nausea, vomiting, abdominal

cramps, diarrhea, and fever. The diarrhea in a number of the patients was unusually severe; it lasted for several days with resulting dehydration and prostration. The 80-year-old patient died of a complicating tibial artery thrombosis, and 1 of the 2 secondary cases of the outbreak occurred in the patient who shared the hospital room of this patient.

None of the 5 family groups had any apparent connection with one another. The only connection they had in common was the purchase of sliced watermelon from the same supermarket in the neighboring town of Milford. Symptoms began in each case 12 to 24 hours after the ingestion of the watermelon.

At first, watermelon appeared to be an unlikely vehicle for the infective agent of the outbreak. However, in 3 of the family units, 1 or 2 members or guests did not eat the watermelon. In each instance these individuals only were not ill. One member of a family ate sparingly of the melon and was only slightly ill. There was, therefore, apparently complete association between the eating of the melon and becoming ill afterward.

The market where the melons were bought was new and clean. The watermelons, which had been on sale for several days before the outbreak, were kept on an open counter. The melons were sold whole or sliced, and the sliced pieces that were awaiting sale were covered with wax paper.

Of the 3 watermelon samples submitted for

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examination to the health department laboratory—1 from each of 2 families and 1 from the supermarket—salmonellae were recovered in pure culture in immense numbers from the watermelons from both homes but not from the market watermelon. Stools were submitted from 9 of the 17 individuals who were ill. All were positive for salmonellae.

No enteric organisms were recovered from the knife used to slice the watermelons in the store, but salmonellae were recovered from the shelf where the knife was stored when not in use. However, no evidence of rodents could be found in the store, and traps especially set caught no animals. No enteric organisms could be recovered from the three clerks involved in slicing the watermelons; so far as could be ascertained, none of the clerks had had a recent enteric illness.

The Species *S. miami*

All of the salmonellae recovered were typed at the National Salmonella Center at the Beth Israel Hospital in New York, which classified them as *Salmonella miami*.

S. miami has been reported by Galton and Hardy as common in Florida (1, 2). They found this organism to be the cause of a food poisoning outbreak where contaminated pickle served in a restaurant was the disseminating vehicle. At various times they recovered it also from dogs, hogs, chimpanzees, and fowl. Although *S. miami* has been reported frequently in the other southeastern States as well as Florida, it is relatively rare elsewhere. It was, however, recovered in Massachusetts from 9 cases of gastroenteritis that occurred in July 1953, chiefly in the metropolitan Boston area. No definite connection between the cases could be discovered at the time, and we can only speculate as to their possible source.

Since the grower's label pasted on the outside of the watermelons indicated the fruit in the present outbreak came from Florida, and since *S. miami* is widespread in Florida (2), it seems reasonable to postulate that the organism may have come with the fruit from that State, rather than from some case or carrier within the store, where evidence of a human or animal source could not be found.

Some Speculation

How the individual watermelons became contaminated is, of course, an interesting question. On the supposition that the outside of the melon might, while in the field in Florida, have become contaminated with fecal material containing the organism and that the inside of the melon might have become contaminated only when the fruit was sliced before sale in the supermarket, we conducted a simple experiment at the diagnostic laboratory of the Massachusetts Department of Public Health.

In the experiment, the outside of a watermelon was swabbed with a dilute suspension of the *S. miami* organism, and then the watermelon was sliced with a clean knife. Cultures made from the cut surface, immediately and also after a few hours, each resulted in a few colonies on bismuth sulfite, but cultures made from the cut surface the following day, with the fruit remaining at room temperature in the meantime, resulted in innumerable colonies on bismuth sulfite. This would suggest that a knife by cutting through a watermelon that was contaminated on the outside with *S. miami* certainly could inoculate the watermelon so that the organisms would multiply upon the cut surface, under conditions prevailing in the supermarket where the melons were sliced for sale.

It was found also that a knife contaminated with a dilute suspension of *S. miami* could similarly inoculate a clean watermelon effectively. Thus, infection could be spread from melon to melon whenever the knife was not washed between cuttings.

Quite another method of contamination appears equally possible. The practice of injecting water into watermelons in this country, as well as in Asia, in order to increase their market weight, has been divulged on good authority. Obviously, contaminated water injected through clean watermelon surfaces, or clean water injected through contaminated watermelon surfaces could infect a number of melons.

Either of these means by which the melons could have become infected is, of course, hypothetical since the actual mechanics of the outbreak can hardly be proved. It does seem likely that the original source of salmonellosis was in

Florida where the melons were grown. In view of the huge number of watermelons sold in the market without previous reports of salmonellosis outbreaks, unless such outbreaks have escaped detection in the past, it does not appear that watermelons, whole or sliced, are a significant public health hazard, but they should be recognized by public health officials as a possible danger.

Summary

An outbreak of gastroenteritis caused by *Salmonella miami* is described. There were 17 primary cases among 5 families and 2 secondary cases.

The only article of food in common was sliced watermelon which had been purchased from the same market. Symptoms occurred 12 to 24 hours after the ingestion of the melon. *S. miami* was recovered from the sliced melon in 2 of the homes, from all of the stools submitted, and from the shelf in the store where the slicing knife was kept.

No evidence of human or animal source could be found in the store.

The melons were obtained from Florida, where *S. miami* is common, and the original

contamination of the melons may have occurred in Florida. Possible mechanics of the contamination of the watermelons are discussed.

. . .

Since writing this paper we have been informed of a similar outbreak of salmonellosis which occurred in Rochester, Minn., in August 1950. There were 6 cases in 2 families.

Each family had purchased half of a watermelon from the same roadside stand on the same day. Salmonella bareilly was cultivated from the remaining portions of the watermelon consumed by both families. Both specimens were heavily loaded with salmonellae. Only one stool specimen was submitted for examination, and this was negative for enteric organisms.

The outbreak was not reported in the medical literature.

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Training in Rehabilitation

An intensive training course in methods and concepts of rehabilitation will be given at the University of California at Los Angeles, April 25-30, 1955, under the joint sponsorship of the university and the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare.

Designed to enable participants to serve as leaders in the advancement of coordinated services for disabled persons, the course is offered for the following rehabilitation supervisory personnel: physicians, nurses, physical therapists, occupational therapists, rehabilitation counselors, and social workers. Participants will be selected on the basis of leadership responsibility in key positions in five western States, but general sessions will be open to all interested members of the various professions. .

Further information may be obtained from: Dr. W. A. Selle, Chairman, Committee on Rehabilitation, Department of Biophysics, School of Medicine, University of California Medical Center, Los Angeles 24, Calif.

Unexpected advantages followed application of Iowa's new hog feeding law, aimed at zoonoses. Lower death losses and heavier herds on a given volume of feed were bonuses in a public health program.

Garbage Cooking in Iowa

By E. ROBERT BAUMANN, Ph.D., and M. T. SKODJE

AN IOWA LAW, which became effective June 1, 1953, requires the cooking of garbage fed to animals. The Iowa Department of Agriculture has the responsibility for enforcement. Regulations issued by the department state that garbage to be fed to swine in the State of Iowa shall be cooked or heated to 212° F. for 30 minutes by one or more of the following methods:

- A. Wet steaming or boiling in an open vat.
- B. Dry steaming or boiling in a jacketed kettle.
- C. Steaming in a pressure cylinder.
- D. Steam boilers.
- E. Direct heating over an open fire.

A survey of the garbage-cooking installations in Iowa was made recently by Iowa State College personnel with the cooperation of the U. S. Bureau of Animal Industry. The survey pro-

vided information on the types of cooking methods being used in the field. This information was used as a basis for the selection of equipment to be used in laboratory studies that the engineering experiment station and the division of veterinary medicine at Iowa State College are now conducting on methods of cooking garbage. The project, titled "The Survival of Swine Disease Organisms in the Heat Treatment of Garbage," is being conducted under a grant from the National Institutes of Health.

Garbage Feeders in State

Up to June 1, 1953, when the law went into effect, there were more than 400 garbage feeders in the State. Most feeders ceased feeding for several probable reasons: First, little was known about methods of cooking garbage; second, many feeders doubted that garbage could be cooked economically; and third, many feeders doubted that the cooked product would be eaten by the hogs. The number of feeders operating under the new regulations has gradually increased until by July 1, 1954, 13 months later, 60 garbage feeders were again feeding hogs. Since most garbage feeders in Iowa usually feed garbage as a sideline, they are comparatively small-scale operators.

As of July 1, 1954, 52 private feeders had been licensed to process garbage for hog food.

Dr. Baumann, formerly research associate in sanitary engineering at the University of Illinois, Urbana, has been associate professor of civil engineering, Iowa State College, Ames, since 1953. Mr. Skodje is associate in civil engineering at the same college. Both are on the staff of the Iowa engineering experiment station. Dr. C. W. Brown, Charles Cumpston, and A. D. Jewell of the U. S. Bureau of Animal Industry assisted in this study.

In addition to the private feeders, there were 8 garbage-processing installations located at Federal and State institutions, which do not require a license.

All of the garbage feeders collect, process, and feed commercial garbage, collected principally from restaurants, hospitals, hotels, food markets, and dormitories. Two feeders collect residential garbage and feed some of it along with the commercial garbage. Some handle a restricted type of garbage. Two feeders handle chiefly bakery-dough wastes, and two handle beef or swine offal and bones. The fuel costs vary from a negligible amount for the operator using scrap wood and tires to from 0.5 to 1.5 cents per hog per day for those operators using oil, kerosene, or bottle gas for fuel.

All of the feeders interviewed indicated that they were satisfied with the requirement that all garbage must be heat treated before feeding. They believed that feeding cooked garbage produced unexpected advantages in lower death losses and an ability to increase their herd size on the same amount of garbage.

On July 1, 1954, 5,275 swine were being fed in Iowa on heat-treated garbage. The average herd was about 88 swine; the largest herd of swine was 579 head, and the smallest was 26. During a normal month, about 1,000 garbage-fed hogs are sent to market from these farms. During the maximum month 1,898 garbage-fed hogs were marketed.

A summary of the various types of garbage-cooking methods used in the State is given in the table.

Two private feeders have not been classified

as to method of cooking. One has not yet installed heat-treatment equipment, and his license is pending. The other is cooperating in the study at Iowa State College and is using all the types of cookers listed in the table. His equipment, therefore, would not be indicative of garbage cooking in Iowa.

Because few commercial cookers were available when the cooking law became effective, 70 percent of the cookers now in use are homemade. Sixty-four percent of the Iowa installations are direct-fired cookers, and of these 66 percent are homemade. The usual direct-fired cooker utilizes a flame in direct contact with the outer surface of the cooking vessel in which the garbage is contained. Most of the 25 homemade installations are simple, covered, rectangular or cylindrical tanks mounted on an earth, brick, or concrete block firebox. The farmer feeder usually utilizes oil as a source of heat, but the nonfarmer feeder, usually located on or near dumping grounds, uses waste tires or wood for fuel. None of the homemade installations visited was designed to use fuel economically.

Direct-Fired Kettles

All 13 commercial direct-fired kettles listed in the table utilize bottle gas, oil, or kerosene for heat. Frequently, the commercial direct-fired cooker is designed as a compact, trailer-mounted, double-walled tank heated with one or two burners. The hot flue gases pass back and forth through the space between the inner and outer walls of the cooker and heat the garbage effectively. Of the 38 direct-fired kettles, only

Garbage cooking in Iowa, in 52 private installations and 8 Federal and State institutional installations, July 1, 1954

Method of cooking	Number of installations	Type of construction			Type of fuel					
		Home-made	Commercial	Unknown	Oil	Coal	Wood or tires	Bottle gas	Kerosene	Unknown
Direct-fired kettles.....	38	25	13	0	13	0	15	8	2	0
Direct steam injection.....	17	15	0	2	5	8	1	0	0	3
Dry-steam coil.....	1	0	1	0	1	0	0	0	0	0
Dry-steam jacket.....	2	1	0	1	0	1	0	0	0	1
Pressure cooker.....	1	0	1	0	0	1	0	0	0	0
Not determined.....	1	0	0	0	0	0	0	0	0	0
Total.....	60	41	15	3	19	10	16	8	2	4

2 commercial, trailer-mounted cookers have mechanical stirrers to mix the garbage and assure even cooking. Observations and experiments by the authors both in the laboratory and in the field have verified the conclusion of the operators that the mixing devices provided are ineffective.

Direct-fired cookers normally have the disadvantage of high heat concentrations at the interface between the garbage and the garbage container. Unless the cooker is well designed, much of the heat is lost through the stack. Some of the advantages of this type of cooker are the rapid heating and the control of the moisture content of the garbage. The maximum amount of water in the garbage can be kept at a minimum with this method. The minimum amount of water, however, is fixed by the characteristics of the cooker and the garbage and is the amount of water necessary to prevent scorching or burning. Although the average commercial garbage is quite wet, all of the Iowa direct-fired installations require that some water be added to the garbage before cooking. Some operators have found it best to heat the water in the cooker before adding the garbage. This helps to prevent scorching or burning.

Direct Steam Injection

Direct steam injection is the second most common method of cooking in Iowa, and 29 percent of all installations are of this type. As the name implies, live steam is injected directly into the garbage to raise it to the boiling temperature. Most of the steam-injection installations are listed as homemade, since the cooking tanks or vats were designed by the operator and fabricated locally. All but one of the installations use commercial steam boilers for steam production. In this one a homemade, closed, cylindrical tank is used for a boiler and the fuel used is wood or old tires. No safety devices are provided at the boiler, and the authors regard this as very dangerous.

The tanks or vats in which the garbage is heated are usually rectangular, truck-mounted units equipped with a removable cover. Tanks are similar but not uniform in construction, and vary in capacity from about 60 cubic feet to 200 cubic feet. Most tanks have metal covers for

heat conservation, although a few have canvas covers.

Two types of racks are in use for distributing the steam throughout the garbage. The first is a removable rack, which is a horizontal grid of pipes with a central steam-pipe header and several transverse laterals. Vertical lances of small diameter pipe are connected to the laterals. The lances are so located that they are spaced uniformly throughout the tank during cooking. Small holes in the vertical pipes permit the steam to flow into the garbage. This pipe rack is lowered into the garbage until the vertical lances penetrate to the bottom of the load. Most operators have found the lance-type pipe rack unsatisfactory because of the labor required to insert the lances into the garbage and because of the uneven steam distribution caused by the steam following the path of least resistance, along the side of the lances.

Although two installations still utilize the vertical lance-type rack, most feeders have converted to the second type of rack used in Iowa. This is a horizontal pipe rack permanently installed in the bottom of the cooking tank. Most installations use a header pipe across the front end of the tank and smaller lateral pipes running lengthwise of the tank. Numerous small holes drilled into the laterals are used for steam distribution. Lateral spacing, hole size, or hole spacing are not uniform. Only two installations are known to provide blowoff valves for clearing the steam lines of condensate and garbage liquor.

Direct-steam-injection cookers provide for maximum heat transfer from the steam to the garbage. A low overall thermal efficiency may sometimes be found, however, if the steam boiler or generator has not been well engineered. Steam produced by the common boiler or low-pressure generator may be a mixture of dry steam vapor and hot water. A boiler or generator in a good garbage-cooking installation should produce steam of high quality. The quality of steam is the percent by weight which is actually dry steam vapor.

The amount of steam required to cook a load of garbage depends upon many factors, including the amount of garbage in the load, the amount of water in the garbage, the temperature of the garbage and the surrounding air, the

physical nature of the garbage and cooker, and the quality of steam used. The hot water included in the steam mixture does not contribute any effective heat during cooking. A possible disadvantage of this method of cooking in colder climates is the large amount of water added to the garbage in the form of condensed steam. None of the feeders interviewed during the recent tour of Iowa, however, found any fault with the amount of water added using this method.

At least two feeders using the direct-steam-injection method of cooking attempted to use commercial steam cleaners for producing steam. The steam produced was found to average about 10–15 percent dry steam and 85–90 percent hot water. The excessive quantities of water added to the cooked garbage by using this low-quality steam forced the abandonment of these steam-producing units. All of the Iowa feeders using direct steam injection operate steam boilers whose steam quality is usually over 90 percent.

Dry-Steam Coils and Jackets

Dry-steam heating is the term sometimes applied to the method of heat application in which the steam does not come into direct contact with the garbage. Instead, the steam transmits its heat through an inner wall of a steam jacket or through a heating coil placed in the load of garbage. Five percent of all Iowa installations are of this type. An advantage of this method over the direct-injection method is the heat economy brought about by mixing the hot steam condensate with the cold make-up water and returning it to the boiler. As in the direct-fired method, Iowa feeders find it necessary to add water directly to the garbage to prevent the garbage from scorching. For this reason, one operator has constructed a combination truck-mounted, dry-steam and direct-steam-injection cooker. A false bottom about 2 inches deep has been built in the bottom of a rectangular tank. Permanently installed vertical lances spaced uniformly around the periphery of the tank lead upward from the false bottom. The vertical risers contain small holes to permit the escape of some steam from under the false bottom into the garbage. The oper-

ator believes that the garbage can be cooked faster and with less added water; but temperature checks by the authors do not substantiate the operator's opinion.

One feeder in Iowa uses a wet-rendering pressure cooker. Operators of a sausage plant in Iowa are processing the offal from their animals and their death losses for use as swine feed in a vertical, wet-rendering cooker. The offal and bones are cooked under 75 pounds per square inch of steam pressure for 14 hours. The installation combines direct steam injection with cooking under pressure to produce an excellent homogeneous product. The cooker outlet is located on the bottom and opens over an open-top farm tank. The inlet is located at the top of the tank. The offal is raised to the inlet by means of a bucket hoist. The cooked offal is dumped directly into the farm tank. The resulting cooked mass is quite fluid and the liquid is decanted off the top of the tank before feeding. The residue is virtually all edible.

"Cold Spots"

Recently about one-third of the Iowa installations were visited by the authors. Most of the cookers examined were found to contain "cold spots" in the tanks or areas where the temperatures of the garbage had not reached at least 170° F. when the cooking was supposed to be complete. No field test other than the mechanical location of cold spots in the garbage has been used to determine whether or not the heat treatment has destroyed the swine disease organisms. Interpretation of the Iowa law is that such cold spots should be brought to a temperature of 212° F. for at least 30 minutes. The temperature of the garbage during cooking must be permanently recorded on an acceptable temperature recorder. The operators have been instructed to locate the temperature recorder at habitual cold spots rather than in "hot spots." Methods for controlling garbage cooking to assure more strict compliance with the heating requirements for destroying swine disease organisms are being evaluated at Iowa State College.

All of the cookers were judged to be adequate to bring the garbage to a boil, provided the operator will conscientiously gauge his opera-

tions by the cold spots in his equipment rather than the hot spots. Sanitary procedure in handling the raw and cooked garbage as well as general sanitation around the cooker and pens appears to be one of the most easily broken links in the defense against swine diseases. The average feeder needs to know and to be impressed with the possibility of infecting his animals as well as those of others by laxity in conforming with the sanitary regulations. Accordingly, the average installation feeding cooked garbage is inspected by State and Federal inspectors from 12 to 24 times during a year. The authorities in Iowa are continually working to raise the standards of sanitation at these installations. As a result, a number of the feeders who operate marginal installations are making plans to increase their investment to improve sanitation and the cooking operation and to reduce garbage handling.

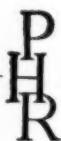
Liquidation Costs

The costs of installing garbage cookers in Iowa have been estimated to range from \$50 to \$3,000. In most cases, little consideration was given to the labor involved in handling and transporting the garbage during and after cooking. As a result, the garbage frequently must be dipped from the cooking tank by hand and transported manually to the feeding troughs. An increasing number of cooking tanks are being provided with chutes and doors to reduce the handling of the garbage. None of the feeders use grinding equipment to provide a more uniform garbage particle size, even though ground garbage would be easier to handle, would pro-

vide for more efficient transfer of heat, and would perhaps make more of the garbage available to the swine. Only two operators make any attempt to agitate the garbage artificially during cooking to secure more even heat distribution. The cost of the treatment is more than offset by increased income from their herds, for the hogs prefer the cooked garbage to raw garbage and a much larger percentage of it.

Conclusions and Comments

1. The Iowa law requiring the heat treatment of garbage resulted in a drop in the number of garbage feeders from over 400 to 60 feeders. The number of feeders cooking garbage has increased steadily, however, during the last 13 months and may be expected to continue to increase.
2. A majority of the cookers are homemade installations which were not designed for maximum heating efficiency or for fuel economy. Commercial cookers are, however, becoming more popular.
3. The direct-fired cooker is used most frequently for cooking garbage. Direct-steam-injection cookers are also used and are becoming more popular.
4. All of the operators interviewed report that they have gained rather than lost under the new regulations.
5. Only 5,275 swine were being fed cooked garbage in Iowa on July 1, 1954. On January 1, 1955, there were 73 licensed feeders in Iowa, feeding cooked garbage to 8,236 hogs. Six Federal inspectors from the Bureau of Animal Industry are now active in Iowa.



Special reference is made to case confirmation studies on Rocky Mountain spotted fever and endemic typhus in Georgia and to effective tick control measures. McDuffie and Smith discuss tick control in further detail on p. 327.

The Status of Rocky Mountain Spotted Fever in the Southeastern United States

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ROCKY MOUNTAIN spotted fever is unique among the arthropod-borne diseases of man now or formerly endemic in the southeastern United States in that no reservoir host other than the tick vector appears to be required. Transovarian transmission occurs, and larvae, nymphs, and adults are all potentially capable of transmitting the infection. Presumably even the egg might infect if it were crushed on the unprotected skin. Nevertheless, extensive research on rickettsial spotted fever over many years has revealed no naturally infected animal in the United States. When the disease is experimentally transmitted to dogs and other mammals, the infection is frequently silent, and the only indication of inoculation is the develop-

ment of Weil-Felix and complement-fixing antibodies (1).

As is well known, the number of infected ticks in nature is subject to great variation but seldom has been found, even in highly endemic areas, to exceed 3 percent (1). Under ordinary circumstances the infection rate is usually of the order of one in many thousands.

In 1902 Wilson and Chowning (2) suggested that Rocky Mountain spotted fever was tick-borne and that the etiological agent was a protozoan. Subsequently Ricketts (3), Parker and his associates in the Rocky Mountain Laboratory of the Public Health Service at Hamilton, Mont., and many others worked out the etiology and epidemiology of the disease and many of the details of tick-host relationships. Man is merely an unusually susceptible bystander, who by occasional accident intrudes himself into the cycle as a very unsatisfactory host for *Dermacentor andersoni* in the western or for *Dermacentor variabilis* in the eastern United States.

Rocky Mountain spotted fever was first identified in the eastern United States in 1931 by Badger, Dyer, and Rumreich (4). Until 1940 it was believed that the eastern strains were less virulent than the Bitterroot Valley strains,

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but in that year Topping and Dyer (5) reported the isolation of a strain, the W strain, from the Potomac Valley, which was in every way similar to the so-called Bitterroot strain. In 1941, in a note on the epidemiology of Rocky Mountain spotted fever, Topping (6) compared the existing data with regard to age and sex-specific morbidity and mortality from Montana and Idaho with that from Virginia and Maryland. Although he noted some interesting differences in attack rates, he showed that age-specific fatality was essentially the same in the east and the west. He also pointed out that *D. andersoni*, a parasite of large wild animals, occurs in greatest numbers at a distance from human habitation in sparsely settled areas while *D. variabilis* is sufficiently adapted to the dog to justify being named the American dog tick. This difference serves to explain the higher incidence of Rocky Mountain spotted fever among children in the east and among adult men who work in tick territory in the west.

Harrell (1) has assembled more recent and extensive data, shown in table 1, which is confirmatory of Topping's thesis. It will be noted that the fatality rates shown are almost identical for the east and the west. During the same period, 1939-46, Georgia had a fatality rate of 18.9 percent.

Comparison With Endemic Typhus

In introducing a comparison between Rocky Mountain spotted fever and endemic typhus, it is interesting to note that when the latter disease was first described in the United States, in 1913, by the late Dr. James E. Paullin (7) of Atlanta, existing epidemiological knowledge did not enable him to differentiate between the infection he described and Brill's disease, the separate etiology of which was first suggested by Zinnser (8) in 1934 and finally clarified by Murray and his associates (9, 10), in 1950 and 1951 as a result of post-World War II developments.

In contrast to Rocky Mountain spotted fever, endemic typhus, we now know, is well established in an abundant mammalian host, the domestic rat, which serves as the reservoir from which the infection is transmitted to man. The principal vector is *Xenopsylla cheopis*, the In-

Table 1. Rocky Mountain spotted fever cases and deaths—selected western and southeastern States, 1939-46¹

State	Cases	Deaths	Percent mortality
<i>West</i>			
Wyoming.....	317	58	18.3
Montana.....	260	63	24.2
Colorado.....	106	26	24.5
Total.....	683	147	21.5
<i>Southeast</i>			
Virginia.....	504	92	18.3
Maryland.....	458	86	18.8
North Carolina.....	346	96	27.7
Total.....	1,308	274	20.9
United States total.....	4,033	929	23.0

¹ See reference 1.

dian rat flea. Control efforts, which have been reasonably successful, consist first, of DDT dusting of rat harborages for the purpose of preventing the spread of infection from rat to rat and from rat to man and, second, of rat control measures (11).

A summary of more recent reporting of Rocky Mountain spotted fever in 10 southeastern States, as compared with typhus, is given in table 2. Certain of the data are of particular interest.

First, it will be noted that the southeast has accounted for about one-half of the reported cases of Rocky Mountain spotted fever in the United States during the 1949-53 period.

Second, these data show that typhus in the southeast has reportedly declined from two-thirds of the national total in 1949 to less than one-half the United States total in 1953.

Third, since 1952, more Rocky Mountain spotted fever than typhus has been reported.

Fourth, it appears that the States of the upper south—Virginia, Kentucky, Tennessee, and North Carolina—have a marked predominance of Rocky Mountain spotted fever over typhus and that typhus leads in the Gulf States and Georgia, while South Carolina is approaching a balance between the two diseases. The fatality rate for Rocky Mountain spotted fever in

Georgia during the total period 1939-53 was 18.1 percent, while the typhus fatality rate was 4.9 percent.

Case Confirmation Studies

Laboratory confirmation of reported Rocky Mountain spotted fever was undertaken in 1939 by the Georgia Department of Public Health in order to determine the true incidence of this disease in Georgia and has been continued to the present time. Confirmation was based on animal protection tests during the early part of the period covered by table 3 and upon complement fixation tests during recent years (see footnote 2, table 3). From the first, these studies have necessarily included cases of endemic typhus because of the similarity in etiology and clinical behavior of the two diseases. Moreover, the Weil-Felix reaction is common to both and not infrequently a case diagnosed as typhus on the basis of a positive Weil-Felix test has been shown to be Rocky Mountain spotted fever. On the other hand, all typhus confirmations recorded from Georgia prior to 1945 were obtained on patients suspected of having Rocky Mountain spotted fever.

A parallel typhus case investigation program came into existence as a result of the reduction in funds available for typhus control. For

planning purposes, it became essential to know whether reported typhus cases gave a true picture of the incidence of this disease.

It will be noted from table 3 that although typhus showed a steady decline after 1945, the incidence of Rocky Mountain spotted fever continued at a comparatively high level through 1949. Much of the decrease in typhus was undoubtedly the result of the DDT and rat control programs (11), and since 1946 the incidence of Rocky Mountain spotted fever has been influenced by the eradication of several suburban foci around Atlanta (15). After about 1949 or 1950, however, the decline in the reported incidence of the two diseases has been affected by the availability of drugs effective in the treatment of rickettsial infections.

The antibiotics—terramycin, aureomycin, and chloramphenicol—produce a marked effect on the clinical course of the two infections. Studies in Georgia and elsewhere also show that these drugs influence the appearance of Weil-Felix and complement-fixing antibodies (14, 16). It is probably safe to say that a relatively small percentage of Rocky Mountain spotted fever and typhus infections now develop to the point of complete diagnosis and reporting.

The notation used in table 4 has no mathematical basis. It is an attempt to show together the Weil-Felix (left) and complement fixation titers (right) on individual specimens. As

Table 2. Reported cases of Rocky Mountain spotted fever and endemic typhus for the United States and southeastern States, 1949-53

State	Rocky Mountain spotted fever					Typhus				
	1953	1952	1951	1950	1949	1953	1952	1951	1950	1949
United States total.....	301	327	347	464	570	230	205	378	685	985
Southeastern States.....	145	158	170	226	284	110	108	190	445	649
Georgia.....	14	8	8	13	28	41	27	58	162	214
Alabama.....	7	2	3	15	11	21	11	12	130	142
Tennessee.....	10	15	17	23	33	7	3	15	12	28
North Carolina.....	38	38	61	70	79	0	12	19	12	26
South Carolina.....	9	6	5	12	8	11	10	22	15	22
Mississippi.....	(1)	6	6	5	3	11	25	16	13	12
Louisiana.....	1	0	1	4	1	7	8	22	62	76
Florida.....	0	2	2	0	0	11	11	20	34	123
Virginia.....	60	79	63	77	101	0	0	3	4	3
Kentucky.....	7	2	4	7	20	1	1	3	1	3

¹ No report.

Table 3. Rocky Mountain spotted fever and typhus fever investigations in Georgia, 1939-53¹

Year	Rocky Mountain spotted fever			Typhus fever		
	Reported cases	Confirmed cases	Deaths	Reported cases	Confirmed cases	Deaths
1953	14	9	2	41	13	2
1952	8	0	1	32	17	4
1951	8	1	3	58	7	5
1950	13	8	1	162	51	4
1949	28	14	2	214	41	14
1948	32	16	8	218	72	18
1947	23	18	5	441	145	31
1946	34	27	4	606	213	33
1945	21	18	5	1, 111	18	59
1944	12	11	4	1, 182	² 1	63
1943	8	6	3	1, 256	² 4	57
1942	8	1	2	1, 153	(²)	52
1941	6	0	1	944	(²)	36
1940	15	12	2	589	(²)	26
1939	7	6	0	1, 131	(²)	44

¹ Includes only cases reported through usual channels to the Georgia Department of Public Health. Does not include 210 typhus cases picked up in epidemiological investigations made by Hill and associates (12, 13) and by Stewart and Hines (14) in Brooks, Grady, Thomas, and Decatur Counties, Ga., during the period January 1945-January 1953.

² Data for 1939-46 are based upon case histories and laboratory confirmations obtained by Dr. T. F. Sellers, then director of laboratories, Georgia Department of Public Health (now, director of the department). Typhus cases confirmed during this period were only in those patients suspected of having Rocky Mountain spotted fever. In 1939-40, confirmation was by animal protection tests carried on by the Typhus Research Unit of the Public Health Service at Albany, Ga. From 1942 to 1946, confirmations were based on complement fixation tests performed at the National Institutes of Health. From 1946 to date, complement fixation tests have been carried on in the Chamblee, Ga., and Montgomery, Ala., laboratories of the Communicable Disease Center, Public Health Service.

will be noted, the development of Weil-Felix antibodies is somewhat delayed under the impact of antibiotic therapy while complement-fixing antibodies may not appear for months, and the final titer may be considerably reduced below the levels formerly obtained. The exact interval of delay cannot be stated since specimens were not obtained with this purpose in view. Terramycin, aureomycin, and chloramphenicol appear to manifest an effect in the order named. Penicillin has no effect on either Weil-Felix or complement fixation titers and no effect on the course of the illness.

Five of the nine cases of Rocky Mountain spotted fever confirmed in 1953 were originally reported as typhus. One of the confirmed typhus cases was reported as Rocky Mountain spotted fever. Five of the 29 unconfirmed typhus cases were classified as presumptive, but 24 of these cases remained diagnostic problems even after prolonged study.

Various possibilities suggest themselves with regard to these cases, but it should be recalled that in Georgia almost all "reported" Rocky

Mountain spotted fever and typhus are picked up by query as the result of positive Weil-Felix examinations done in health department laboratories. The difficulty is therefore apparently serologic, arising from the suppression of rickettsial infections by antibiotics referred to previously.

Fortunately, followup specimens can be obtained on the majority of Weil-Felix positive cases, and on cases on which complement fixation tests have been requested if the surveillant agency is prepared to assist, either directly or through local health departments, in obtaining specimens. It is also necessary in requesting specimens to persevere to the point at which persistence ceases to be a virtue.

The problem of obtaining convalescent and postconvalescent specimens is difficult indeed when the initial Weil-Felix reaction is negative. Although the case may be diagnosed as spotted fever or endemic typhus, second specimens are seldom forwarded unless the patient continues to be ill after treatment with broad spectrum antibiotics. This leaves the laboratory in a

quandary since it appears impractical to catalog and hold negative serums on suspected cases indefinitely on the assumption that a later specimen may show a rise in titer. Negative specimens are now retained for approximately 1 month in the laboratories of the Georgia Department of Public Health.

Tick Control Methods

During recent years the possibility of using certain compounds as tick repellants has been investigated by several workers. These compounds have been applied as dusts and aerosols to skin and clothing and as solutions or emulsions to clothing.

Despite statements in the literature which imply otherwise, roadside and pathside control of *D. variabilis* and, in our experience, of *Amblyomma americanum* is so easily obtained with insecticides that chemical control has very definite application in inhabited areas of high Rocky Mountain spotted fever hazard or even where tick annoyance is the only problem. Dust, sprays, mists, and possibly even fogs, with several of the older insecticides are reasonably effective. It is conceivable that some of the newer insecticides, for example dieldrin (17), would be even more useful, but we have had little occasion to try them in Georgia.

Interest in the control of Rocky Mountain spotted fever in Georgia reached a high point in 1945 following the occurrence of 24 clinical cases, 17 of which were serologically confirmed, in the semiurban regions of De Kalb and Fulton Counties (Atlanta) during the period 1939-45. In 1946, when work was begun in the Alexander Estates section of De Kalb County, the most seriously affected area, the entire section was beginning to drop in the economic scale despite its being conveniently located, already subdivided, and having city conveniences available. When no Rocky Mountain spotted fever cases occurred during the next 2 years, the situation changed completely. By 1951 homes had been erected on every lot available for construction, and a shopping center had developed in the area.

The following insecticides have been used successfully in tick control:

DDT, at the rate of 2.5 lb. of actual insecticide per acre for dusts, sprays, mists, and fogs. If rosin-DDT emulsion is used in a good mist machine, 1.5 lb. of DDT per acre gives good residual control of *D. variabilis* for an entire tick season. No burning of vegetation was noted when rosin emulsion was applied along roadsides.

Chlordane, at 1 lb. per acre, is almost as effective as DDT in dusts, sprays, mists, and fogs.

Table 4. Weil-Felix/complement fixation results in 12 patients diagnosed as having Rocky Mountain spotted fever and treated with antibiotics, 1953-54

Patient	Blood specimen			Time onset to last blood specimen	Drug
	1st	2d	3d		
1	640/N	N/N		Months 2	Terramycin.
2		N/8		7	Do.
3	1280/N	320/N	N/16	6	Do.
4	320/N	-/N	320/8	2	Aureomycin.
5	N/-	80/64		2	Do.
6	320/N	N/-	N/32	6	Do.
7	640/N	640/8		2	Do.
8	80/N	80/16		6	Chloramphenicol.
9	1280/N	1280/N		Days 18	Do.
10	N/N	N/N	N/N	9	Do.
11	640/N	2560/N	60/64	Months 2	{Terramycin. Chloramphenicol. Penicillin.
12		N/256		6	

NOTE: Dash (—) means test not done or results unknown, and N means negative.

Benzine hexachloride, at one-half pound per acre, was inferior to DDT and chlordane. It gave best results when applied as a mist.

Methoxychlor, at 2.5 lb. per acre, gave good immediate control but broke in less than 1 month.

Smith, Cole, and Gouck (18) pointed out in their classic study on the American dog tick that this tick (*D. variabilis*) tends to collect along roadsides and paths. This fact has occasioned the interest of Knutson (19) and others in the use of very narrow dust or spray barriers along roadsides. Glasgow and Collins (20) report use of DDT dust at a rate of 1 lb. per acre in a 4-foot wide strip. Knutson used a low pressure, low gallonage sprayer to apply 4 lb. of DDT per acre in a strip 6-8 feet wide. In a single narrow barrier dust experiment repeated by us, very good results were obtained.

Nevertheless, these methods afford protection only to persons or animals who stay in the road and do not venture across the barrier. Children and dogs have a tendency to go to the ticks even though the ticks cannot come to them. For this reason, and also because power equipment, particularly mist generators, will give excellent coverage of a 50- to 100-foot strip along roadways, a wider swath has been used by us. Results have been equal to those described in narrow barrier experiments, the immediate knockdown is more extensive, and the residual effect is probably as great although no one has had an opportunity to make a comparative study. In addition, McDuffie and associates (21) have reported data which imply that reinfestation tends to occur more slowly when the treated area is large.

Wide-strip spraying is an easier technique in use since one can "offset" the line to be treated and operate from the roadway. Narrow barrier application with power equipment runs afoul of telephone poles, trees, benches, signs, and other obstacles. In wide-strip application it is convenient to apply insecticide in two runs, with the spray or dust aperture pointed at the road edge on one trip and set for maximum distance on the second.

Summary

Rocky Mountain spotted fever is a disease of measurable though not great public health im-

portance in the southeastern United States. It ranks with or exceeds endemic typhus as a cause of morbidity and mortality in all the States of the area (Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia).

Reporting of all rickettsial infections has been adversely affected by the availability of effective chemotherapeutic agents. The rickettsial infections are so well masked by antibiotics that many cases are aborted and diagnosis with complete laboratory confirmation is a rarity. Development of complement-fixing antibodies is delayed sometimes for 6 or more months. Confirmation of diagnosis in recent years has been achieved largely as the result of epidemiological followup of cases by public health agencies.

Tick repellants have been developed to a point which makes their use practical by persons working or playing in infested areas. Chemical control of ticks in thickly settled Rocky Mountain spotted fever foci has been satisfactorily achieved. Barrier spraying along roadsides is sufficiently simple and effective to merit consideration wherever ticks annoy enough people to make tick control economically acceptable.

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Blind Vending Stand Operators

Nearly 1,670 blind vending stand operators and their employees earned approximately \$4.8 million during fiscal year 1954, the United States Office of Vocational Rehabilitation in the Department of Health, Education, and Welfare reported in January. These are the highest net earnings ever recorded by the blind men and women who operate vending stands under the Randolph-Sheppard and State laws.

In fiscal year 1953 net earnings for these businesses were approximately \$4.5 million.

This year's record was made by the blind operators with the aid of 272 blind and 629 sighted employees. The blind operators averaged \$2,200 each. Virtually all blind persons in the vending stand program were prepared and trained by their State vocational rehabilitation agencies.

Nearly 1,600 stands are currently operated under the Randolph-Sheppard Act, 573 of these being on Federal sites. Under recent amendments to the act, vending stands can be established on all types of suitable Federal property—in national parks, for instance. In the past this authority has applied only to federally owned or leased buildings. The Federal law has always required that preference be given to qualified blind persons as operators of stands on Federal property.

It is estimated that there are 308,000 blind persons in the United States today. Of this number, only about 8 percent are employed in all types of occupations. Experience in the rehabilitation of disabled individuals has indicated that about 25 percent of those disabled by blindness can be rehabilitated into gainful employment.

Idea

For Heart Research

BETHESDA, Md. Although the inflated cuff method of taking an indirect blood pressure reading is satisfactory for most diagnostic purposes, it is frequently necessary in cardiovascular research to obtain a very precise pressure measurement directly within the blood vessel.

This can now be done with the dependable, inexpensive, easily portable apparatus for making such blood pressure records, which has been recently developed by the Public Health Service at the Laboratory of Technical Development, National Heart Institute. The instrument was designed by Frank W. Noble,

Dr. James J. Callaway, and Dr. Bert R. Boone, chief of the laboratory.

The instrument consists of a simple electrical circuit, housed in a small metal box called a control box, which can be made for a few dollars by following easy instructions. This control box and its circuit provide the proper link between a standard physiological strain gauge and a direct-writing electrocardiograph. When attached to a conventional electrocardiograph, the instrument produces accurate pressure recordings formerly available only by the use of costly and complex instruments.

Pressure in the blood vessel is measured by the strain gauge and is translated into electrical forms acceptable to the electrocardiograph by the control box. The control apparatus houses a circuit which enables the investigators to insert a zero pressure reference point into the rec-

ord at will. The pressure records thus obtained are of good accuracy and provide measurements of pulse contours, and of mean, systolic, and diastolic pressures. The device is expected to provide savings to those physicians and clinicians not having access to expensive pressure recording apparatus.

The operation of the instrument is illustrated in the photograph. Pressure signals obtained from a needle placed in a blood vessel of the arm are picked up by the strain gauge (left) and pass through the control box (right) to the electrocardiograph (center) where they are recorded on standard electrocardiograph paper.

Detailed information may be obtained from Dr. Bert R. Boone, Chief, Laboratory of Technical Development, National Heart Institute, National Institutes of Health, Public Health Service, Bethesda 14, Md.



Recommended Current Treatments for Tick Control

By W. C. McDUFFIE and CARROLL N. SMITH, Ph.D.

MANY SPECIES of ticks occur in the United States, and a number of them are important pests of man. Several species known as wood ticks infest recreational areas, lawns, and houses, as well as woods. Most of them will attack man, and their bites cause pain and discomfort. Certain species are also important vectors of disease. The Rocky Mountain wood tick (*Dermacentor andersoni* Stiles) and the American dog tick (*Dermacentor variabilis* Say) are the principal vectors of the dreaded Rocky Mountain spotted fever and are also capable of transmitting tularemia (1,2). The lone star tick (*Amblyomma americanum* L.) apparently is not an important disease vector, although it has been shown to carry tularemia, Rocky Mountain spotted fever, and Bullis fever, but it probably is a more frequent source of annoyance in the southern States than any other species.

The black-legged tick (*Ixodes ricinus scapularis* Say) and several other less common species

apparently are not carriers of disease and do not readily attack man, but they are annoying under certain conditions. Although they are not wood ticks, ticks belonging to the genus *Ornithodoros* are extremely painful biters, and several species are vectors of relapsing fever.

The widespread distribution of ticks and the fact that they are vectors of serious diseases as well as a source of annoyance have aroused much public interest in methods of control and protection from these pests. The armed services are also greatly interested in methods of safeguarding troops in camps and maneuver areas where ticks occur. At the Orlando, Fla., laboratory of the Entomology Research Branch, United States Department of Agriculture, special attention has been given to the development of insecticides and repellents for use by the armed forces. Most of these materials are suitable for general use and are therefore worthy of recommendation to the public.

This brief review outlines what can be done to control ticks and to protect individuals from tick attacks.

Mr. McDuffie and Dr. Smith are entomologists with the Orlando, Fla., laboratory, Entomology Research Branch, Agriculture Research Service, of the United States Department of Agriculture. Their report on the control of, and protection from, ticks, on which this paper is based, was presented at the annual meeting of the Southern Branch of the American Public Health Association, St. Petersburg, Fla., April 21-23, 1954.

Control With Insecticides

Ticks vary a great deal in their habits and distribution. It is therefore desirable to determine the area of infestation before attempting to apply an insecticide. Identification of the species will often provide a general idea of its distribution. For example, the American dog tick usually is concentrated along the edges

of paths or roads, whereas the lone star tick may be less regularly distributed over the infested area.

Area Treatments

The distribution and abundance of ticks can be determined by slowly dragging a white flannel cloth over the ground and vegetation and examining it at intervals of about 100 paces, or by careful observation of the ground and vegetation at randomly selected points in an area.

A number of chlorinated hydrocarbon insecticides will control the common species of ticks in their natural habitats (3-5). DDT, chlordane, toxaphene, and dieldrin are especially effective. Applications of from 1 to 2 pounds an acre will usually give good control within a few days and prevent reinfestation of an area for a month or more.

Lindane and benzene hexachloride (BHC) are also highly effective. Applications equivalent to only 0.1 pound an acre of gamma isomer of BHC will immobilize all stages of the lone star tick within a few hours. In this respect, BHC is far superior to the other chlorinated hydrocarbon insecticides. However, one-half pound of BHC, or more, is usually necessary to assure effective control of existing tick populations and freedom from reinfestation for several weeks or more.

As little as one-fourth pound of parathion an acre will provide excellent, immediate control of ticks and apparently prevent reinfestation for a month or more. No information is available on the effectiveness of other organic phosphorus insecticides, but several of them probably would give control. However, because parathion and some other phosphorus insecticides are highly toxic to man and animals, they should be employed only in an emergency or when none of the chlorinated hydrocarbon insecticides is available.

Pyrethrum and nicotine sulfate will give quick knockdown of ticks and some measure of control. However, since neither material possesses much residual toxicity, frequent applications are necessary to keep ticks under control. Pyrethrum sprays and dusts should contain 0.1 to 0.2 percent of pyrethrins. Nicotine sulfate sprays should contain 0.5 to 1 percent of the toxicant, and dusts, 2 percent.

Sprays and dusts may be applied with equally good results. Their effectiveness is dependent on the amount of insecticide and the thoroughness with which it is distributed over the infested area. Applications of from 15 to 25 gallons of spray an acre are required to treat lawns or similar areas where the vegetation and ground cover are relatively thin, but 50 or more gallons an acre are required for thorough coverage of woods or brushy areas. The concentration of insecticide in the spray should be adjusted to give the desired dosage for an acre. Suspensions and emulsions are preferable to oil solutions, which will burn the vegetation and which also are expensive.

Applications of from 20 to 25 pounds of dust an acre will usually give adequate coverage in thinly vegetated areas, but in woods and brushy areas 40 pounds an acre may be needed. Five-percent and 10-percent dusts are equally suitable. Using a 10-percent dust at a rate of 25 pounds an acre will give more than the necessary amount of insecticide, but this may be necessary to achieve good control under adverse conditions and will at all times assure a maximum period of freedom from reinfestation.

The type of equipment to use in applying treatments for the control of ticks will depend on whether the area is small or large. A 2-gallon or 3-gallon hand sprayer or a plunger-type or rotary-type hand duster is satisfactory for treating lawns and grounds up to 1 or 2 acres. On larger areas a power sprayer or duster should be used. When power equipment is used, swath intervals should not exceed 40 to 50 feet. Attempts to drift sprays or dusts over wider swaths will give uneven coverage and erratic results.

Sprays may be applied by airplane or helicopter provided that the vegetative canopy is not too dense for the material to penetrate. Good control of the American dog tick along roadsides and lightly wooded areas has been obtained with 1 pound of DDT per acre in 1 or 2 gallons of oil solution (5,6).

Aerial applications of sprays containing 5 pounds of DDT or one-half pound of BHC (10 percent gamma isomer) an acre reduced the numbers of lone star ticks in typical wooded and brushy habitats but did not give satisfactory control (4). Apparently most of the spray

adhered to the vegetation, and the amount reaching the ground litter was insufficient to form an effective residue. However, in heavily wooded areas in South Carolina, aerial applications of 2 or 3 pounds of DDT an acre gave immediate reductions of 20 to 70 percent of the ticks. This reduction gradually rose to 70 to 90 percent over a period of 2 months when check populations were increasing (3). Similar treatment might be effective against this species in lightly vegetated or relatively open areas, or if the insecticides are applied as dusts or granules.

It is advisable to start area treatments early in the spring when ticks first become annoying. However, because the potential of reinfestation is greatest during the spring, subsequent treatments may be necessary. A treatment made late in the spring or early in the summer when tick populations are at their peak will usually provide satisfactory control for the rest of the season.

House Treatments

Wood ticks seldom infest houses, but sufficient numbers may be brought in on the clothing or by animals to cause some annoyance to the occupants. If ticks are found in large numbers in a house, they are most likely to be brown dog ticks (*Rhipicephalus sanguineus* Latr.), since that species is scattered by dogs (7). The brown dog tick can pass its entire life cycle indoors if dogs are kept in the house. This species seldom attacks man, but its presence in households is no less disturbing to the occupants than that of other species.

Tick infestations in houses can be controlled with many of the sprays that have been approved for household use. Formulations containing DDT, chlordane, or lindane, or combinations of these materials are especially effective contact killers. Thorough applications on baseboard, floor, and wall surfaces will continue to kill ticks for several weeks if the residues are not removed. If it is sufficiently thorough, a single treatment will control an infestation, although ticks will continue to come from their hiding places over a period of several weeks until all are killed. If large numbers of ticks continue to appear after the second or third

week after spraying, a second application should be made.

Dusts may also be used for the control of ticks in houses, but they are more difficult to apply than sprays and are unsightly in exposed places.

Because tick infestations in houses are difficult to eradicate and treatments are often odorous and unsightly, the homeowner should take care to prevent infestations. Members of the household should remove infested clothing before entering the house, and dogs should be treated periodically with insecticides. Approved formulations for the treatment of animals are available commercially. If these precautions are taken and ticks are kept under control on the premises, infestations will rarely occur in houses.

Protection With Repellents

The application of a repellent to exposed skin provides little protection against ticks, since they crawl underneath clothing and attach on untreated portions of the body. The application of repellents to the entire body might prevent attachments for a few hours, but such extensive treatments are impracticable and might prove injurious. For these reasons, clothing treatments with repellents are suggested instead of skin treatments.

Clothing Treatments

The mosquito repellents, dimethyl phthalate and 2-ethyl-1,3-hexanediol, are not first-rate tick repellents, but they will provide fairly good protection as clothing impregnants. A person wearing socks, shirt, and trousers impregnated with 2 grams of one of these materials per square foot can expect about 75-percent protection from ticks. Better protection can be obtained with Indalone, but it is not as widely available. All three repellents are safe for use as clothing treatments at the dosage indicated (8,9).

N-Butylacetanilide, *N*-propylacetanilide, undecylenic (hendecenoic) acid, and hexyl mandelate are highly effective tick repellents, but none of them has been cleared for unrestricted civilian use. They may be used only under adequate supervision, such as that given to troops.

Clothing should be saturated with a solution

or emulsion of the repellent by dipping the garment into it or by pouring on enough to saturate it.

Rayon and nylon fabrics should not be treated with repellents. Nylon is nonabsorbent and will not retain enough repellent to be effective, and rayon is injured by some repellents.

A 5-percent solution or emulsion of the repellent will give a deposit of about 2 grams a square foot on denim, ordinary cotton khaki, or light wool clothing. About 3 pints is required to thoroughly wet a complete outfit of socks, shirt, and trousers of these fabrics. A smaller amount is sufficient for lighter fabrics.

Acetone and dry-cleaning solvents are suitable for use in impregnating both cotton and woolen clothing. Slightly less than an ounce of repellent to a pint of these solvents will make about a 5-percent solution. One ounce of repellent, 1 pint of water, and 2 ounces of a good emulsifier, such as Tween 80 or Triton X-100, or 1 ounce of laundry soap, will make an emulsion containing about 5 percent of repellent. The laundry soap should first be dissolved in the water; then the repellent should be added slowly to the mixture while it is being stirred vigorously by hand or with a household mechanical mixer. The synthetic detergents in common use for dishwashing and other household cleaning are not suitable for making emulsions, but most of the soaps are satisfactory.

After clothing has been wetted, it should be wrung out by hand, hung up outdoors, and allowed to dry thoroughly before it is worn. Properly treated clothing will provide good to excellent protection against ticks, as well as chiggers and mosquitoes, for several days to a

week if it is not subjected to wetting by rains or wading in streams or lakes. Clothing should be thoroughly washed and re-treated at weekly intervals or before each infrequent excursion outdoors.

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Relationship of Industrial Carcinogens to Cancer in the General Population

By PAUL KOTIN, M.D., and W. C. HUEPER, M. D.

AWARENESS of environmental cancer and recognition and acceptance of the extent of this problem are increasing in the United States.

A rapidly growing accumulation of evidence suggests that industry-related or occupational cancer hazards carry as a corollary a similar, though diluted or attenuated, hazard for the general population. The industrialization of society during the past half century has resulted in certain new socioeconomic phenomena, one of which has been the concentration of population in close proximity to industrial sources of environmental pollution. This concentration

of population and the recent advent of the atomic age, the era of synthetics, and the petroleum economy, when combined with epidemiological observations, indicate that a general population hazard is of more than theoretical significance.

This hazard may be evaluated by two complementary methods of study. The first is an epidemiological-statistical analysis of both occupationally and environmentally exposed persons, using morbidity and mortality data; the second is the experimental assessment of the carcinogenicity and carcinogenic potency of known and suspected materials in the environment. The summation of both approaches often permits of conclusions impossible with either approach alone. Questions as to the value of experimental studies may be disposed of on the basis of the knowledge that confirmed or highly suspect environmental carcinogens have been proved to be carcinogenic for appropriate animal species. For those substances in which carcinogenicity is still lacking suggestive confirmation, experimental studies have been essentially unsuccessful in terms of tumor production.

In those other instances in which proved experimental carcinogens have thus far failed to demonstrate an analogous human tumorigenic response, it must be remembered that latency or the initiation-promotion-tumor development sequence in human beings is a long one and substances such as plastics (1), selenium (2),

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This paper was presented before the occupational disease sessions of the International Congress of Clinical Pathology, Washington, D. C., September 8, 1954. Part of the work reported was supported by a grant from the Field Investigations and Demonstrations Branch, National Cancer Institute.

and beryllium (3), which have been used to produce experimental cancers, are relative newcomers in quantity to the human environment.

Industry-related carcinogens may enter the general environment through the atmosphere, water supply, soil, foodstuffs, medicaments, cosmetics, and products of industrial manufacture.

Numerous hydrocarbon compounds, of both the aliphatic and aromatic type, are released into the atmosphere secondary to the combustion of solid or liquid fuels in both industrial installations and through the exhausts of gasoline and diesel engines. Arsenicals may reach the atmosphere secondary to the manufacture and use of arsenical pesticides and the smelting of arsenic-containing ores. Radioactive substances may pollute the atmosphere subsequent to nuclear explosions, radioactive ore mining and smelting, and radioactive product manufacture.

Water and soil pollution frequently occur secondary to petroleum and other hydrocarbon source manufacture and subsequent to the disposition of radioactive wastes.

A potential hazard occurring in foodstuffs exists in the as yet incompletely studied role of pyrolyzed fats in carcinogenesis and the presence of synthetic food dyes, which may possess certain carcinogenic properties.

Products of industrial manufacture for general population use continue to increase in the direction of the utilization of petroleum derivatives as the sources of numerous household substances and of macromolecular compounds in the form of synthetics and plastics.

In addition to the sources and their environmental sites, carcinogens may be classified on the basis of their chemical and physical state and of the target tissue. Chemically, they may not only be present as highly complex molecular organic structures but also as inorganic substances, such as chromium, nickel, and arsenic. Physically, they may be in the form of ionizing radiation. Of additional physical significance is the dynamic nature of chemical compounds. Any biological activity, proved or postulated, may be critically related to the physical nature of any suspected chemical, including, for example, such factors as state of adsorption, elutability, and particle size.

Target tissues for carcinogenic substances include the skin, bones, lungs, upper respiratory tract, liver, bladder, and hemopoietic tissue. The activity of these substances within specific organ sites may be on the basis of initial contact, such as soot on the skin; site of metabolism or detoxification, such as azo dyes in the liver; or site of concentration and elimination, such as aromatic amines in the genitourinary tract.

Analyses of population groups have not only shown a demonstrable difference in liability to cancer on a geographic and demographic basis, but individual groups in specific geographic areas frequently show variations in cancer incidence. One of the bases for subgrouping has been the socioeconomic levels of population segments. One of the common denominators in socioeconomic levels is the environmental spectrum to which members are exposed.

Industry-Related Carcinogens

A brief discussion of several specific industry-related materials shown to be either experimentally or clinically carcinogenic may serve to indicate the need for and method of study of additional potentially hazardous materials.

Arsenic has been demonstrated to be a relatively common atmospheric and water contaminant secondary to mining and milling operations of arsenic-contaminated ores. Chronic arsenicosis in exposed population groups with an excessive incidence of skin cancer has been described by investigators. Arsenic has also been incriminated as a potential skin cancer hazard when used medicinally. However, its role in carcinogenesis is still being debated, especially in relation to the development of lung cancer; as a contaminant of tobacco and as the possible *modus vivendi* of the Schneeberg and Joachimsthal lung cancers.

Beryllium shares with arsenic an as yet ill-defined though highly suspicious place in the spectrum of potential carcinogens. The experimental production of cancers combined with the report of "neighborhood cases" of berylliosis adjacent to areas where beryllium is used in industry removes the problem from one of strictly "in-plant" industrial significance (4).

That radiation is a hazard to the general population is attested to by the reports of the ex-

aggerated prevalence of leukemia in exposed residents of Hiroshima and Nagasaki subsequent to the bombings.

Estrogenic substances, food dyes, tobacco, heavy and light metals, macromolecular compounds, and polymers are some of the additional compounds in need of elucidation in terms of their hazard to the general population.

Air Pollution and Lung Cancer

The role of atmospheric hydrocarbon substances must be mentioned as they relate to the reported increasing incidence of lung cancer. In a study of polluted atmosphere and sources of atmospheric pollution in a large urban American community, many previously reported findings were confirmed and certain additional initial observations were made, all quite possibly related to the pathogenesis of lung cancer in man (5):

1. Soot-containing carcinogenic hydrocarbons of the dibenzanthracene series have been recovered from the atmosphere and their presence has been quantitated.

2. Sources of the atmospheric hydrocarbons have been defined, with gasoline and diesel engine exhausts and industrial effluents being demonstrated as some of the sources.

3. Extracts of both atmospheric soots and pollutant source materials have been successfully used in skin painting experiments to produce skin cancers in C57 black mice, a strain which is normally resistant to spontaneous cancer.

In addition to this confirmatory work, analytical and biological studies have resulted in the following new observations. First, oxidation products of short chain aliphatic compounds have been demonstrated in the atmosphere, and these, too, have been successfully used to produce skin tumors in mice. Second, these

experimentally carcinogenic substances, as present in the atmosphere in highly polar aerosol form, may serve as potential eluting agents for the soot adsorbed carcinogens so that action on the bronchial mucosa by these hydrocarbons becomes theoretically possible.

These observations parallel most dramatically the increasing incidence of lung cancer. The period since the initiation of large-scale introduction of industrial pollutants into the atmosphere is entirely compatible with the latent period now generally accepted for the development of lung cancer, which ranges from 10 to 40 years. Furthermore, they are congruous with the reported difference in frequency of urban and rural lung cancer. In rural areas, air pollutants are present in a diluted form, and the tumor-dose exposure of rural residents is on a lower level than that of urban residents, the latent period is prolonged, and the incidence is lower.

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technical publications

The Social Worker's Role in Mental Health

Public Health Service Publication No. 351. 1954. 12 pages; illustrations. 10 cents.

This booklet develops the theme that mental health components are inherent in the practice of social work, regardless of specialization, and particularly in psychiatric social work. Consequently, the social worker is in an unique position to bring a mental health approach to his work with individuals and with families. It contains outlines of the various specialized fields of social work.

This booklet is the fourth in a series of five pamphlets which deal respectively with the role of the nurse, the policeman, the supervisor, the social worker, and the teacher in the mental health field.

Tuberculosis Beds in Hospitals and Sanatoria, April 1, 1954

Public Health Service Publication No. 412. 1954. 54 pages; tables. 40 cents.

The ninth edition of this index indicates that there are 1,124 institutions which provide care of some kind for tuberculous patients. Of these, 713 provide 115,157 beds for the care of tuberculous patients. The remaining 411 hospitals take patients for diagnosis, for surgery, or for emergency treatment pending transfer to other institutions but, in general, do not have a specific number of beds set aside for these purposes. Of the total number, 992 are non-Federal institutions (State, city, county, and district operated), and 132 are operated by the Federal Government.

In the continental United States alone there are 1,097 institutions with facilities for the care of tuber-

culous patients; 973 are non-Federal, of which 568 have 90,652 tuberculosis beds, and 124 are federally operated, 122 of which have 19,275 beds.

The index lists each institution and shows its rated capacity for tuberculous patients, and includes information about occupancy, type of hospital and ownership. A comparison is made with the occupancy information collected in April 1953 and new construction is discussed. Selected information is shown for each State.

The Teacher and Mental Health

Public Health Service Publication No. 385. 1954. 20 pages; illustrated. 15 cents.

The teacher's supportive role in helping the child meet his emotional needs is explained in this publication. It points out what some of the States and school systems are doing to provide teachers with a knowledge of the dynamics of mental health principles. Also, a list of books, pamphlets, reprints, and films on the subject of mental health is included.

This is the fifth and last pamphlet in a series of pamphlets which deals respectively with the role of the nurse, policeman, supervisor, social worker, and teacher in mental health.

State Heart Disease Control Programs as Planned for Fiscal Years 1954 and 1955

Public Health Service Publication No. 406. 1954. 33 pages; tables. 30 cents.

Presented in abstract form are the plans of the States, Territories, and the District of Columbia for their heart disease control programs covering, for the most part, the 2-year period beginning with the fiscal year 1954.

The abstracts are based on the State plans, required by the Federal Social Security Act of 1935, of all State agencies participating in grant programs administered by the Public Health Service. Program plans were submitted in either of two forms, the State making its choice: the old style annual combined report and plan; or the new narrative type plan—adopted in 1952—placing emphasis on planning on a program basis rather than on an organizational basis.

Because of differences in the States' presentations of detail and quantitative information, the abstracts in this publication are quite diverse, particularly with respect to specificity and elaboration of details. No attempt has been made to evaluate the program content in the abstracting. The proposed elements reported by the responsible State officials are presented concisely, giving the outline of each State health department's program for heart disease control.

The abstracts are arranged on a regional basis, conforming to the established regions of the Department of Health, Education, and Welfare, to relate the common problems existing among States located within specific regional areas. Selected administrative information, including placement of program responsibility and staff assignments, of each State's heart disease control program is shown in tabular form.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

Plague in the United States of America

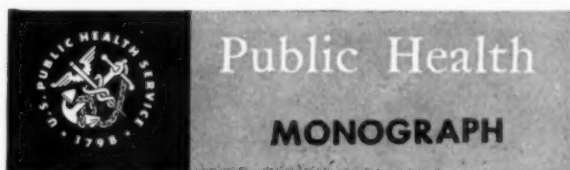
By **VERNON B. LINK, M.D., M.P.H.**

Plague is no longer a dreaded killer on the loose. There are several reasons for this important change in status. Antibiotic and chemotherapeutic agents have been shown to have almost specific curative action. If given early enough, they are capable of holding mortality rates to a very low figure, probably less than 5 percent. This is remarkable even in bubonic plague, since the untreated disease results in about 2 deaths in every three cases, and especially in pneumonic and septicemic plague, for which the mortality used to be practically 100 percent. In addition to these curative measures, there are now available effective rodenticides and insecticides to control the epizootics which occur in domestic rats and which are spread by their fleas. These chemicals are able to break the infection chain between rat and man and minimize the danger of man's becoming infected.

This favorable situation in regard to one of mankind's most ancient and deadly enemies is the result of a great deal of effort by plague fighters all over the world. The arrival at this turning point prompted the author to prepare this monograph in order to record how plague has affected this country, to point out the part that the Public Health Service played in its control, and to highlight the contributions made by Service officers.

Plague has been one of the great epidemic killers of all times. It is given credit for an assist in the downfall of the Roman Empire because of the havoc wrought by the Plague of Justinian. In this great pandemic during the sixth century A. D., an estimated 100,000,000 persons succumbed to the disease. Plague is alleged to have been partially responsible for

speeding up the end of the Middle Ages and hastening the era of Renaissance because of the tremendous impact of its second great pandemic, better known as the Black Death. One out of every four persons in Europe, or about



No. 26

The accompanying article summarizes the report on the history of plague in the United States presented in Public Health Monograph No. 26. The author is deputy officer in charge of the Communicable Disease Center, Public Health Service, Atlanta, Ga.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch, Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

Link, Vernon B.: A history of plague in the United States. Public Health Monograph No. 26 (Public Health Service Publication No. 392). U. S. Government Printing Office, Washington, D. C., 1955. Price 60 cents.

25,000,000 of the population of that continent, are conservatively said to have died from the Black Death, and uncounted millions died in the other continents of the world. Even in modern times, in the third great pandemic, which started in 1894 and which still hasn't quite burned itself out, plague has continued to exhibit its enormous killing capacity with a reported death toll to date of about 13,000,000 victims.

This third great pandemic had its origin in the Yunnan Province of China, resulting in an epidemic focus in Canton in 1894. From there it spread to Hong Kong and subsequently to nearly every country in the world. It invaded India in 1896 and in a few years was causing over a million deaths a year.

It is no wonder, then, that the occurrence of a death from plague in March 1900 in San Francisco, Calif., was viewed with serious alarm by the local, State, and Federal public health officials of this country. For 6 years the pandemic had been spreading from its epidemic foci in China, and country after country had become involved. Not much could be done to prevent this spread because so little was known about the disease.

The causative organism, *Pasteurella pestis*, had been identified in 1894. Vaccines and serums had been prepared which were of some value in prevention and treatment but were not always effective. Practically nothing was known about the way in which the disease was transmitted, what the reservoir hosts were, or whether an insect vector was involved. Because of this lack of knowledge and the absence of effective preventive and therapeutic measures, panic and hysteria usually followed outbreaks of the disease. This was the situation when plague first invaded this country in 1900.

In those days, the Public Health Service, known then as the Marine-Hospital Service, was much smaller than it is today and there was a personal touch in its work that is somewhat lacking now. This was reflected in *Public Health Reports* and the annual report of the Surgeon General, both of which contained copies of orders, telegrams, letters, and reports

concerning current public health problems. By careful study of these publications it is easy to follow the story of the epidemics that occurred, developed, and were brought under control in this country. As the years went by the Public Health Service grew to the point where it was not possible to record all of its activities in such detail in *Public Health Reports* and the annual report and, as a result, it is much more difficult to follow the course of events which have occurred in more recent years. For example, these sources do not reflect adequately the tremendous amount of effort exerted by the Service's Plague Laboratory in the period from 1936 to 1950, when practically the entire western half of the United States was routinely surveyed for evidence of plague infection among wild rodents and their fleas.

Another source of material for this monograph is the papers on plague published by the Public Health Service officers. These are relatively large in number when one considers the fact that there have been only 523 cases of human plague in this country.

This monograph tells a story of successful efforts against a major disease even in the days when the more specific preventive and therapeutic measures were not available. It summarizes control efforts in San Francisco, Seattle, New Orleans and other Gulf Coast cities, Los Angeles, Hawaii, and Puerto Rico. It highlights the efforts made to rid seagoing vessels of rats and to keep them that way. Finally, it points out the residual hazards inherent in the fact that the wild rodents of 17 of the westernmost States are still infected with plague and could be the source for reinfection of domestic rodents in western cities.

The final chapter in the fight against plague in this country cannot yet be written. It will be possible to do so only when a biologically feasible and economically practical method can be developed to rid the western United States of its plague infection in wild rodents. In the meantime, constant vigilance will have to be maintained in order to prevent plague from initiating epizootics among rats of western cities.

Milk Sanitation Honor Roll for 1953-54

Sixty-two communities have been added to the Public Health Service milk sanitation "honor roll" and 73 communities on the previous list have been dropped. This revision covers the period from January 1, 1953, to December 31, 1954, and includes a total of 279 cities and 63 counties.

Communities on the "honor roll" have complied substantially with the various items of sanitation contained in the Milk Ordinance and Code Recommended by the United States Public Health Service. The State milk sanitation authorities concerned report this compliance to the Public Health Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized, and for those in which both raw milk and pasteurized milk is sold.

The recommended milk ordinance, on which the milk sanitation ratings are based, is now in effect through

This compilation is from the Division of Sanitary Engineering Services of the Bureau of State Services, Public Health Service. The previous listing, with a summary of rules under which a community is included, was published in Public Health Reports, September 1954, pp. 889-892. The rating method was described in Public Health Reports 53: 1386 (1938) and in Reprint No. 1970.

voluntary adoption in 415 counties and 1,593 municipalities. The ordinance also serves as the basis for the regulations of 34 States and 2 Territories. In 11 States and the 2 Territories it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as stated in the recommended ordinance. High-

grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

Although semiannual publication of the list is intended to encourage communities operating under the recommended ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they were more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

Communities awarded milk sanitation ratings of 90 percent or more, 1953-54

100 PERCENT OF MARKET MILK PASTEURIZED

Community	Date of rating	Community	Date of rating	Community	Date of rating
<i>Alabama</i>		<i>Colorado—Continued</i>		<i>Georgia</i>	
Auburn.....	9-24-1953	Las Animas-Huerfano		Albany.....	12-16-1954
<i>Arkansas</i>		Counties.....	3- 9-1954	Athens.....	4-16-1953
Fort Smith.....	8-26-1954	Weld County.....	11-25-1953	Atlanta.....	10-17-1953
<i>Colorado</i>		<i>District of Columbia</i>		Augusta-Richmond	
Colorado Springs.....	1-20-1954	Washington.....	3-15-1954	County.....	10-30-1953
Denver.....	11- 3-1953	<i>Florida</i>		Bainbridge.....	8- 6-1953
Grand Junction and		Jacksonville.....	8-27-1954	Calhoun, Gordon	
Mesa County.....	4-15-1954	Pinellas County.....	1-29-1953	County.....	7-16-1954
				Columbus.....	2-23-1953
				Elberton.....	2- 9-1954

Communities awarded milk sanitation ratings of 90 percent or more, 1953-54—Continued

100 PERCENT OF MARKET MILK PASTEURIZED

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Georgia—Continued</i>		<i>Indiana—Continued</i>		<i>Mississippi—Continued</i>	
La Grange.....	7-15-1954	New Castle.....	2-1953	Clarksdale.....	10-13-1954
Quitman.....	4-9-1953	Richmond.....	5-15-1953	Columbus.....	3-26-1954
Savannah, Chatham County.....	8-12-1954	Rushville.....	6-1953	Corinth.....	6-11-1953
Statesboro.....	12-3-1954	Shelbyville.....	9-1954	Greenville.....	9-14-1954
Swainsboro, Emanuel County.....	5-5-1954	Valparaiso.....	5-13-1954	Greenwood.....	4-19-1954
Tifton.....	6-18-1953	Vincennes.....	9-4-1953	Houston.....	5-28-1953
Valdosta.....	4-29-1954	<i>Iowa</i>		Iuka.....	7-9-1953
Waycross.....	2-4-1954	Des Moines.....	8-12-1953	Louisville.....	9-16-1953
<i>Idaho</i>		Marshalltown.....	1-29-1953	Macon.....	6-11-1954
Moscow.....	9-1953	Sioux City.....	9-18-1953	Meadville.....	10-13-1954
<i>Indiana</i>		Waterloo.....	10-7-1953	Okolona.....	5-28-1953
Anderson.....	6-18-1953	<i>Kansas</i>		Ruleville.....	4-13-1954
Bedford.....	8-30-1954	Dodge City.....	4-20-1953	Tupelo.....	4-8-1953
Berne.....	3-3-1953	<i>Kentucky</i>		Vicksburg.....	7-10-1954
Bloomington.....	6-1954	Bowling Green.....	1-7-1954	Winona.....	11-24-1953
Bluffton.....	3-6-1953	Brandenburg.....	8-12-1954	<i>Missouri</i>	
Calumet Regions.....	6-12-1953	Frankfort and Franklin County.....	7-23-1953	Lebanon.....	2-13-1953
East Chicago		Fulton County.....	1-21-1954	St. Joseph.....	7-16-1953
Gary		Georgetown.....	10-16-1954	St. Louis.....	12-10-1953
Hammond		Hickman.....	1-20-1954	Springfield.....	3-2-1954
Cooperative Grade A Milk Program.....	6-28-1954	Hopkinsville.....	12-10-1953	<i>Nevada</i>	
Holland		Leitchfield.....	11-24-1954	Ely, McGill, and Ruth..	4-6-1954
Huntingburg		Louisville and Jefferson County.....	4-7-1954	<i>North Carolina</i>	
Jasper		Monticello.....	7-13-1954	Avery County.....	1-15-1954
Tell City		Morgantown.....	1-8-1954	Burke County.....	1-15-1954
Crawfordsville.....	10-2-1953	Murray.....	4-29-1954	Charlotte.....	1-4-1954
Edinburg.....	12-1953	Newport and Campbell County.....	11-3-1953	Chatham County.....	11-19-1953
Elkhart.....	9-1954	Owensboro.....	6-18-1954	Clay County.....	10-27-1953
Evansville.....	6-30-1953	Owenton and Owen County.....	4-2-1953	Craven County.....	2-12-1954
Franklin.....	12-1953	Paducah and McCracken County.....	8-18-1953	Cumberland County..	1-20-1954
Greencastle.....	5-19-1954	Pendleton County.....	4-2-1953	Durham County.....	7-27-1954
Huntington.....	9-25-1953	Williamstown and Grant County.....	4-2-1953	Granville County.....	7-21-1953
Indianapolis.....	9-15-1954	<i>Mississippi</i>		Guilford County.....	6-28-1954
Lafayette and West Lafayette.....	10-14-1954	Aberdeen.....	10-7-1953	Henderson-Transylva- nia Counties.....	2-18-1954
Lebanon.....	6-1953	Amory.....	10-7-1953	Lee County.....	11-19-1953
Logansport.....	4-9-1954	Boonesville.....	9-9-1953	Mitchell County.....	10-23-1953
Madison.....	8-1954	Brookhaven.....	3-4-1954	Nash County (exclud- ing Rocky Mount)...	9-17-1953
Martinsville.....	11-20-1953			New Hanover County..	5-28-1954
Mount Vernon.....	10-18-1954			Northampton County..	4-21-1954
Muncie.....	1-28-1953			Onslow County.....	5-6-1953
Nappanee.....	11-1953			Orange County.....	6-9-1953
				Person County.....	3-17-1953
				Pitt County.....	5-15-1953
				Richmond County.....	2-2-1954

Communities awarded milk sanitation ratings of 90 percent or more, 1953-54—Continued

100 PERCENT OF MARKET MILK PASTEURIZED

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>North Carolina—Continued</i>		<i>Tennessee—Continued</i>		<i>Utah</i>	
Rockingham-Caswell		Memphis.....	3-25-1954	Ogden.....	11-10-1953
Counties.....	3-12-1954	Milan.....	6-30-1954	Salt Lake City.....	3-30-1954
Rocky Mount.....	9- 8-1953	Morristown.....	5-26-1954	Utah County.....	6-10-1953
Wilson County.....	9-18-1953	Murfreesboro.....	7- 2-1953		
<i>Oklahoma</i>		Nashville and David- son County.....	10-28-1953	<i>Virginia</i>	
Ardmore.....	4-21-1954	Newport.....	10- 5-1954	Abingdon.....	11- 5-1953
Duncan.....	1-19-1954	Pulaski.....	6- 3-1953	Bristol.....	11- 5-1953
Guthrie.....	5-25-1954	Shelbyville.....	6- 9-1954	Buena Vista.....	8- 4-1953
Mangum.....	12-17-1953	Sparta.....	5- 5-1954	Front Royal.....	8- 7-1953
Okmulgee.....	10-13-1953	Spring City.....	5-14-1953	Lexington.....	8- 4-1953
Seminole.....	10- 1-1954	Springfield.....	7- 6-1953	Luray.....	8- 7-1953
Sulphur.....	2-18-1953	Trenton.....	6-30-1954	Marion.....	11-18-1953
Tulsa.....	7-28-1954	Union City.....	8-12-1953	Norfolk.....	5-18-1954
<i>Oregon</i>		<i>Texas</i>		Portsmouth.....	5-18-1954
Eugene.....	6-11-1953	Brenham.....	4-10-1953	Richmond.....	4-16-1954
Klamath Falls.....	5- 7-1954	Brownwood.....	7-16-1954	Roanoke.....	8-20-1954
Pendleton.....	6-19-1953	Bryan.....	8-30-1954	South Boston.....	3- 8-1954
<i>South Dakota</i>		Dallas.....	9-29-1954	Staunton.....	6-25-1954
North Hill Unit.....	7-20-1953	Denison.....	6-24-1954	Suffolk.....	7- 1-1954
Belle Fourche		Donna.....	2-25-1953	Waynesboro.....	6-25-1954
Deadwood		Edinburg.....	2-25-1953	Williamsburg.....	10- 9-1953
Lead		Falfurrias.....	5- 5-1953		
Spearfish		Galveston.....	7-24-1954	<i>Washington</i>	
Sturgis		Harlingen.....	6- 1-1953	Bellingham.....	8-21-1953
<i>Tennessee</i>		Houston.....	5-28-1954	Cowlitz County.....	7-30-1953
Athens.....	8-10-1954	Kerrville.....	8-13-1954	Everett.....	6-22-1953
Bristol.....	11- 5-1953	Kilgore.....	7-14-1954	Port Angeles.....	9-10-1953
Clarksville.....	1-30-1953	Lufkin.....	3- 9-1953	Spokane.....	9-16-1954
Cleveland.....	10-13-1954	McKinney.....	2-17-1953	Walla Walla.....	10-15-1953
Clinton.....	4-21-1954	Mercedes.....	2-25-1953	Whitman County.....	10-14-1954
Columbia.....	5-19-1954	Mineral Wells.....	2-11-1953		
Cookeville.....	6-16-1953	Mission.....	2-25-1953	<i>Wisconsin</i>	
Dandridge.....	11-10-1953	Nacogdoches.....	9- 3-1954	Beaver Dam.....	2-27-1953
Fayetteville.....	6- 2-1953	New Braunfels.....	9- 2-1954	Burlington.....	3-26-1953
Franklin.....	5-20-1954	Pampa.....	4- 7-1953	Delavan.....	3-26-1953
Gallatin.....	7- 8-1953	Pharr.....	2-25-1953	Eau Claire.....	3- 5-1953
Greeneville.....	6- 5-1954	Port Arthur.....	6-29-1954	Elkhorn.....	3-26-1953
Humboldt.....	6-30-1954	San Antonio.....	3-25-1953	Fontana.....	3-26-1953
Jefferson City.....	5-26-1954	San Benito.....	5-30-1953	Green Bay.....	9-17-1953
Johnson City.....	9-23-1954	San Juan.....	2-25-1953	Lake Geneva.....	3-26-1953
Kingsport.....	10- 8-1953	Sweetwater.....	2-10-1953	Madison.....	10-26-1953
Knoxville.....	8- 6-1953	Texarkana.....	6- 4-1954	Manitowoc.....	6- 4-1953
Lebanon.....	8-27-1954	Texas City.....	1-20-1953	Ripon.....	2-27-1953
Lewisburg.....	6-10-1954	Tyler.....	2-10-1953	Sheboygan.....	6-19-1953
Livingston.....	1-27-1954	Weslaco.....	2-25-1953	Tomah.....	5- 6-1953
Loudon.....	5- 6-1954	Wichita Falls.....	4- 6-1954	Waupun.....	2-27-1953
				Williams Bay.....	3-26-1953

Communities awarded milk sanitation ratings of 90 percent or more, 1953-54—Continued

BOTH RAW AND PASTEURIZED MARKET MILK

<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>
<i>Arkansas</i>		<i>Montana</i>		<i>Tennessee</i>	
Little Rock, 99.3.....	4-20-1953	Missoula, 99.....	11- 5-1954	Dayton, 92.1.....	5-14-1953
<i>Florida</i>		<i>North Carolina</i>		Harriman, 98.....	10-15-1953
Dade County, 99.99....	1-8 -1953	Buncombe County, 97.8.....	6-25-1953	Jackson, 98.6.....	11- 5-1953
Escambia County, 99.6.....	6-30-1954	Davidson County, 96.4.....	7-28-1953	Kingston, 96.....	10-14-1953
Manatee County, 99.57.....	8-21-1953	Haywood County, 95....	11- 5-1953	McMinnville, 90.....	5- 5-1954
<i>Georgia</i>		Lenoir County, 78.4....	1-30-1953	<i>Texas</i>	
Cedartown, 97.7.....	11-19-1954	Moore County, 93.6....	3-12-1954	Abilene, 98.9.....	6-15-1954
Gainesville - Hall County, 92.2.....	4- 9-1954	Robeson County, 96.8..	1-11-1954	Amarillo, 98.....	5-11-1954
Griffin, 98.2.....	9- 3-1954	Vance County, 91.2....	7-22-1953	Austin, 98.6.....	6-11-1954
Marietta, 96.2.....	5- 4-1954	Wake County, 99.3....	3- 4-1953	Brady, 94.....	8- 7-1954
Newnan, 92.8.....	7-23-1954	Wilkes County, 91.9....	9- 2-1953	Brownsville, 96.....	5-29-1953
Thomaston, 87.4.....	6-17-1954	<i>Oklahoma</i>		Childress, 87.....	2- 4-1953
Thomasville, 99.5.....	6-17-1953	Ada, 87.....	7- 8-1953	Fort Worth, 99.97....	4-28-1954
Toccoa - Stephens County, 88.....	4- 9-1954	Elk City, 98.8.....	4-29-1954	Gladewater, 98.8....	7-14-1954
Washington - Wilkes County, 99.....	9-24-1953	Enid, 96.6.....	3-30-1954	Longview, 99.6.....	7-14-1954
Winder, 97.9.....	1-23-1953	Henryetta, 88.....	1-16-1953	Lubbock, 99.....	8-20-1954
<i>Idaho</i>		Hobart, 90.....	1-23-1953	Marshall, 91.....	4-26-1954
Twin Falls, 98.96.....	4-15-1954	Lawton, 99.....	12- 1-1953	Palestine, 95.1.....	6-15-1954
<i>Kentucky</i>		Norman, 98.....	2-19-1954	Paris, 92.6.....	9-25-1953
Henderson, 98.9.....	9-23-1954	Oklahoma City, 97.8..	9-28-1953	Waco, 99.....	7-28-1954
Princeton and Caldwell County, 94.7....	6- -1953	Ponca City, 92.6.....	2- 4-1954	<i>Washington</i>	
Somerset, 91.....	2- -1953	Shawnee, 98.9.....	12-17-1953	Seattle-King County 99.7.....	6-23-1953
		Stillwater, 97.....	4-29-1954	Tacoma, 99.7.....	7-16-1954
		<i>Oregon</i>		<i>West Virginia</i>	
		Astoria, 97.9.....	4-22-1953	Kanawha County, 98..	
		Portland, 99.4.....	9-30-1954		
		Salem, 99.3.....	4- 6-1953		

NOTE: In these communities the pasteurized market milk shows a 90-percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90-percent or more compli-

ance with the grade A raw milk requirements, of the Milk Ordinance and Code Recommended by the United States Public Health Service.

Note particularly the percentage of the milk pasteurized in the various

communities listed. This percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, either commercially or at home, before it is consumed.